Muelleria

Volume 7

Number 1

April 1989

NATIONAL HERBARIUM OF VICTORIA

LANDS & FORESTS DIVISION

DEPARTMENT OF CONSERVATION, FORESTS AND LANDS

Muelleria

Volume 7, Number 1

April 1989

CONTENTS

Volume 7, Number 1 Page

Two new lichens: *Cladonia paeminosa* and *C. humilis* var. *bourgeanica*
— Alan W. Archer 1

Eucalyptus cadens (Myrtaceae), a new swamp gum from the Warby Range, North-East Victoria
— J. D. Briggs and M. D. Crisp 7

Azorella Lamarck (Apiaceae) on Heard and Macquarie Islands, with description of a new species
— A. E. Orchard 15

Notes on *Hovea* R. Br. (Fabaceae): 2
— J. H. Ross 21

A revision of *Podotheca* Cass. (Asteraceae: Gnaphaliinae)
— P. S. Short 39

Notes on the fruit anatomy of Australian members of the Inuleae (Asteraceae)
— P. S. Short, K. E. Wilson and J. Nailon 57

Two new species of *Pomaderris* Labill. (Rhamnaceae) from South-Eastern Australia
— Neville G. Walsh 81

A new subspecies of *Grevillea acanthifolia* (Proteaceae: Grevilleoideae) from South-Eastern New South Wales
— R. O. Markinson and D. E. Albrecht 89

A new species of *Tetrarrhena* R.Br. (Poaceae) from Victoria and New South Wales
— Neville G. Walsh 95

Ferdinand Mueller, Government Botanist: the role of William Hooker in his appointment
— Helen M. Cohn 99

New genera and species of Australian Inuleae (Asteraceae)
— P. S. Short 103

Olearia archeri (Asteraceae: Astereae), a new name for a familiar species from Tasmania
— N. S. Lander 117

Olearia astroloba (Asteraceae: Astereae), a new species endemic to Victoria
— N. S. Lander and N. G. Walsh 123

Valid publication of the names *Torrenticola* and *T. queenslandica* (Podostemaceae)
— Helen I. Aston 127

Acacia caerulescens, a new species of *Acacia* section *Phyllodineae* from Victoria
— B. R. Maslin and A. B. Court 131

Notes on *Hovea* R. Br. (Fabaceae): 3
— J. H. Ross 135

Editor: D. B. Foreman

Published by the National Herbarium of Victoria (MEL).
Royal Botanic Gardens, South Yarra, Victoria 3141, Australia.

The date of distribution of **Volume 6, number 6** was 29 March 1988.

TWO NEW LICHENS: *CLADONIA PAEMINOSA* AND *C. HUMILIS* VAR. *BOURGEANICA*

by

ALAN W. ARCHER*

ABSTRACT

Archer, Alan W. Two new lichens: *Cladonia paeminosa* and *C. humilis* var. *bourgeanica*. *Muelleria* (1): 1–5 (1989). — *Cladonia paeminosa* A. W. Archer and *Cladonia humilis* (With.) Laundon var. *bourgeanica* A. W. Archer are described as new. Both taxa contain fumarprotocetraric and bourgeanic acids and occur in Australia. *C. humilis* var. *bourgeanica* also occurs in Europe and North and South America.

INTRODUCTION

A recent examination of undetermined specimens in the lichen genus *Cladonia* (Ascomycetes, Lecanorales) in Herbarium collections from South Australia (AD) and Tasmania (HO) revealed specimens that were not referrable to any known taxa; similar specimens had been collected by the author in Victoria, New South Wales and the Australian Capital Territory. These specimens which resemble *Cladonia scabriuscula* (Del. in Duby) Nyl. and contain fumarprotocetraric and bourgeanic acids are here described as a new species.

A recent typification (Laundon 1984) of the lichens described by William Withering in the eighteenth century showed that the name *Cladonia conista* C. Robb. ex Allen was illegitimate as the epithet *conista* belonged to the synonymy of *Cladonia humilis* (With.) Laundon. The name '*C. conista*' has referred to a sorediate, scyphose taxon containing fumarprotocetraric and bourgeanic acids which Laundon (*loc. cit.*) referred to as an undescribed variety of *Cladonia humilis*. This variety is here formally named and described.

METHOD

The lichen compounds present in the specimens examined were identified by thin-layer chromatography of acetone extracts, using the mobile phases described by Culberson (Culberson 1972) and the separated compounds were detected with sulphuric acid (Culberson 1972) and MBTH (Archer 1978). The presence of bourgeanic acid (substance H) was confirmed with the micro-crystal test described by Thomson (Thomson 1967) and by mass spectrometry (*cf.* Bodo *et al.* 1973).

TAXONOMY

Cladonia paeminosa A. W. Archer, sp. nov.

Sicut *Cladonia scabriuscula* sed podetiis subsimplicibus, basibus podetiorum ecorticatis et acidum bourgeanicum continens.

Primary squamules small, inconspicuous, persistent, 1×2 mm, subdigitately lobed, margins smooth, green above, white below. *Podetia* arising from the squamules, 15–50(–100) mm tall, 0·5–1·5 mm diam., escyphose, simple or dichotomously branched, axils open, tapering towards the apices, the apices simple or bifurcating, subulate or with terminal pycnidia; ecorticate, or corticate at the base and becoming ecorticate, with tiny corticate patches scattered along the podetia, minutely squamulose, esorediate. *Apothecia* pale brown, terminal, convex, (0·2–) 0·5–1·0 mm diam. *Ascospores* eight per ascus, colourless, simple, ellipsoid, 12–14 µm long, 3–4 µm

*Division of Analytical Laboratories, Department of Health, P.O. Box 162, Lidcombe, New South Wales, Australia 2141.

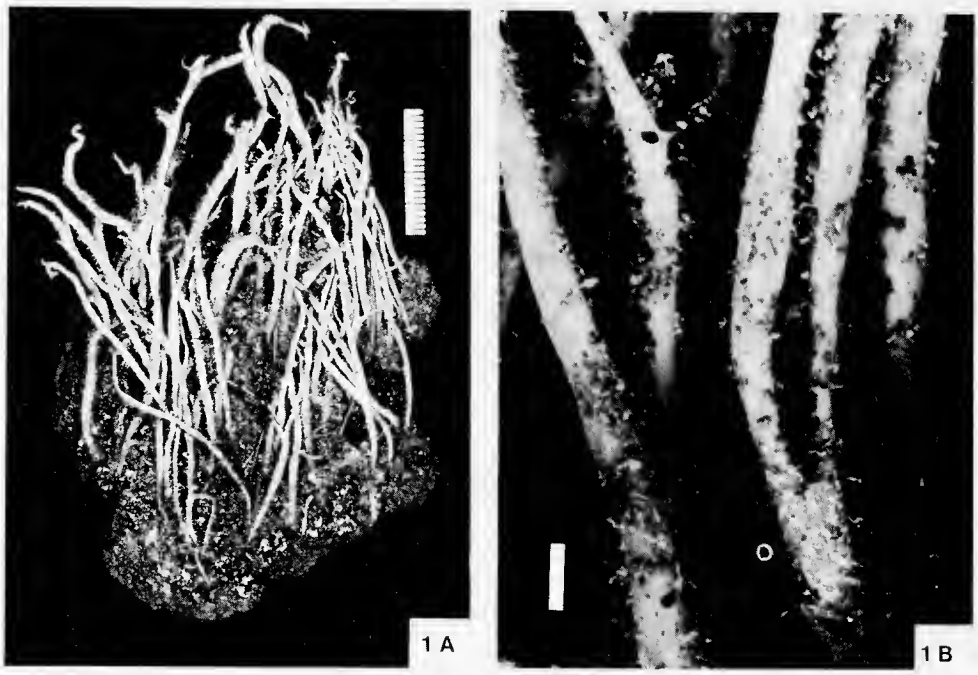

Fig. 1a. *Cladonia paeminosa.* Holotype. Scale in millimetres.

Fig. 1b. *Cladonia paeminosa.* Holotype. Close-up of podetia. Bar = 1 millimetre.

wide. *Pycnidia* terminal, black, subconical, 0·3 mm × 0·3 mm; conidia not seen. *Thallus* K−, KC−, Pd+ red; containing fumarprotocetraric and bourgeanic acids (Figs 1–2).

TYPUS: Australia, Victoria, near Mirimbah, by side of Mt Stirling Road, *c.* 30 km E. of Mansfield, 146° 25′ E., 37° 07′ S., alt. *c.* 700 m, 9.xi.1986, *A. Archer 2027* (HOLOTYPUS: MEL 1050876. ISOTYPI: ANUC, CBG, H, NSW).

FURTHER SPECIMENS EXAMINED:

South Australia — 14 km SE. of Mt Burr Township, 7.ix.1966, *I.B. Wilson 516* (AD 9255); Marshes Swamp, 24.vii.1980, *N. Donner 6997* (AD 4862); *ibidem*, 23.x.1982, *N. Donner 9577* (AD 9235).

New South Wales — 4 km S. of Termeil, 7.iii.1970, *E. Dahl* (CANB 227416); Black Flat, Currowan State Forest, 15 km NW. of Batemans Bay, 150° 04′ E., 35° 36′ S., alt. *c.* 200 m, 28.v.1983, *A. Archer 2113* (NSW).

Australian Capital Territory — Fishing Gap Trail, 33 km SW. of Canberra, 148° 52′ E., 36° 29′ S., alt. 900 m, 1.iv.1983, *A. Archer 2098* (MEL 1050870, NSW).

Victoria — on earth near sea, Mentone, 15.v.1886, *F.R.M. Wilson* (NSW); on mossy earth, Cunningham, iii.1890, *F.R.M. Wilson* (NSW); Narbethong, Healesville, viii.1906, *Mrs Goodyear* (NSW); by side of Howqua River, near Sheepyard Flat, *c.* 30 km SE. of Mansfield, 146° 20′ E., 37° 12′ S., alt. *c.* 500 m, 3.ix.1986, *A. Archer 2069* (MEL 1050874, NSW).

Tasmania — St Mary's Pass, *G. Bratt 73/646* (HO 54009); Prosser River Gorge, *J. Gilbert, s.n.* (HO 60742); Drip Falls, *M. Westbrook, s.n.* (HO 50617).

DISCUSSION

The specific epithet '*paeminosa*' refers to the rough surface of the podetia. *C. paeminosa* (Fig. 1a) is morphologically similar to *C. scabriuscula* (Del. in Duby) Nyl. but differs from that species in often lacking a well-defined corticate area at the base and on the lower part of the podetia. *C. paeminosa* has small irregular corticate patches along the podetia (Fig. 1b) and contains the aliphatic acid bourgeanic acid which is lacking in *C. scabriuscula.* Both species contain the depsidone fumarprotocetraric acid. *C. scabriuscula* has been reported to contain the depside atranorin (Culberson

Fig. 2. *Cladonia humilis* var. *bourgeanica*. Holotype. Scale in millimetres.

1970) or the triterpene ursolic acid (Thomson 1968), in addition to fumarprotocetraric acid. Specimens with atranorin are common in Chile (Ahti & Kashiwadani 1984) but only one Australian specimen (AD 4868) was found with atranorin. Ursolic acid was not found in any of the Australian specimens of *C. scabriuscula* examined. *C. scabriuscula* often occurs in large clumps with the much branched podetia dying at the base; in contrast, *C. paeminosa* is much less branched and often remains attached to the primary thallus on the soil on which it grows. Apothecia were seen in only one specimen of *C. paeminosa*, from South Australia. *C. scabriuscula* is a cosmopolitan species, widely distributed in Australia and occurs in all states whereas *C. paeminosa* is so far known only from south-eastern Australia and Tasmania. *C. paeminosa* belongs to the group *Cladonia* sub-group *Furcatae* in the recently proposed subgeneric classification of the genus *Cladonia* (Huovinen & Ahti 1982).

Cladonia humilis (With.) Laundon var. **bourgeanica** A. W. Archer, var. nov.
Cladonia conista auct.

Sicut *Cladonia humilis* var. *humilis* sed acidum bourgeanicum continens vice atranorinum.

Primary squamules persistent, conspicuous, 1–2 mm × 1–5 mm, rounded, lobed, margins slightly crenate, green above, white below, esorediate. *Podetia* growing from the upper surface of the primary squamules, simple, scyphose, lacking marginal or central proliferations, 5–20 mm tall, scyphi 3–6 mm diam., the podetial stalk corticate, the cortex areolate at the base, becoming sub-verrucose, rarely minutely squamulose at the base; the scyphi ecorticate and farinose sorediate, the interior

closed, ecorticate and farinose sorediate, margins entire or minutely denticulate, becoming slightly revolute in older specimens. *Apothecia* and *pycnidia* not seen. Thallus K−, KC−, Pd+ red; containing fumarprotocetraric and bourgeanic acids.

TYPUS: Australia, New South Wales, Six Foot Track, Binomea Ridge, 2 km N. of Jenolan Caves, 150° 02′ E., 33° 48′ S., alt. 1100 m, 13.iii.1987, *A. Archer 2086.* HOLOTYPUS: MEL 1050873; ISOTYPUS: NSW.

FURTHER SPECIMENS EXAMINED:

Australian Capital Territory — Kambah Pool, 28.vi.1970, *E. Dahl* (CANB 227965); near Honeysuckle Creek, 20 km SSW. of Canberra, 148° 58′ E., 35° 35′ S., alt. 1100 m, 2.iv.1983, *A. Archer 2097* (NSW); by side of Two Sticks Rd, 35 km W. of Canberra, 148° 48′ E., 35° 19′ S., alt. 1100 m, 30.x.1985, *A. Archer 1822A* (NSW); near Tidbinbilla River, *c.* 27 km SW. of Canberra, 148° 55′ E., 35° 28′ S., alt. 900 m, 21.iv.1986, *A. Archer 1935* (NSW).

Victoria — by side of Mt Stirling Rd, Mirimbah, *c.* 30 km E. of Mansfield, 146° 25′ E., 37° 07′ S. alt. 700 m, 5.xi.1986, *A. Archer 2005* (H, MEL 1050879); *ibidem* 9.xi.1986, *A. Archer 2024* (MEL 1050878).

Tasmania — Table Mountain, *G.C. Bratt 72/930* (HO 53023); Finger Post Track, *A.M. Gray 36* (HO 69121); Mt Wellington, *D. Ratkowsky L129* (BM, NSW).

DISCUSSION:

The combination *Cladonia conista* (Ach.) C. Robb. ex Allen (Allen 1930) was based on *Cenomyce fimbriata* var. *conista* Ach.; a specimen collected by Flörke was chosen as lectotype (Ahti 1966). The basionym of the epithet was later reported (Ahti 1980) to be superfluous and hence illegitimate and the combination *C. conista* (Nyl.) C. Robb. ex Allen was proposed, based on *C. fimbriata* f. *conista* Nyl. This combination was rejected as the basionym was published without a description (Laundon 1984), thus leaving the bourgeanic acid containing variety of *C. humilis* lacking a valid name. The epithet '*bourgeanica*' is here proposed for this chemical variety.

C. humilis var. *bourgeanica* (Fig. 2) is distinguished chemically from var. *humilis* by the presence of the fatty acid bourgeanic acid in place of the depside atranorin. Both varieties are distinguished from the somewhat morphologically similar *C. fimbriata* (L.) Fries by the presence of bourgeanic acid or atranorin and the corticate podetial stalk, absent in *C. fimbriata.* Two specimens of *C. humilis*, containing both atranorin and bourgeanic acid with fumarprotocetraric acid, have been reported, one from Chile (Ahti & Kashiwadani 1984) and a second specimen from Argentina (T. Ahti, in litt., 1987).

C. humilis var. *bourgeanica* is a widely distributed taxon and occurs in Europe, North America and South America. In Australia it has been found only in south-eastern Australia and Tasmania, in contrast to var. *humilis* which occurs in all States except Queensland. *C. humilis* var. *bourgeanica* has also been reported, as *C. conista*, from New Zealand (Martin 1958); the specimen on which this report was based [Mt Cargill, Dunedin, Otago, *W. Martin 4414* (CHR 385665)] was found to contain only fumarprotocetraric acid and is identified as *C. chlorophaea* (Floerke ex Sommerf.) Sprengel.

C. humilis var. *bourgeanica* belongs to the infra-generic group *Cladonia* subgroup *C. grayi* and allies (Huovinen & Ahti 1982).

ACKNOWLEDGEMENTS

The author is grateful to Professor T. Ahti, Helsinki, for much helpful discussion and to the National Herbarium of New South Wales for arranging the loan of specimens, and acknowledgement is made to the Director, Division of Analytical Laboratories, for permission to publish this paper.

REFERENCES

Ahti, T. (1966). Correlation of the chemical and morphological characters in *Cladonia chlorophaea* and allied lichens. *Annls. bot. fenn.* 3: 380–390.

Ahti, T. (1980). Nomenclatural notes on *Cladonia* species. *Lichenologist* 12: 125–133.

Ahti, T. & Kashiwadani, H. (1984). The lichen genera *Cladia*, *Cladina* and *Cladonia* in southern Chile. *In* Inoue, H. (ed.), 'Studies on Cryptogams in Southern Chile' pp. 125–151. (Kenseisha Ltd: Tokyo.)
Allen, A. F. (1930). Cladoniae from the valley of the Cap Chat, Gaspe Peninsula. *Rhodora* 32: 91–114.
Archer, A. W. (1978). 3-Methyl-2-benzothiazolone hydrazone hydrochloride as a spray reagent for phenolic lichen compounds. *J. Chromatogr.* 152: 290–292.
Bodo, B., Hebrard, P., Mohlo, L. & Mohlo, D. (1973). Un nouvel acide aliphatique des lichens *Desmaziera evernioides et Ramalina bourgeanica*. *Tetrahedron Letters* 18: 1631–1634.
Culberson, C. F. (1970). 'Chemical and Botanical Guide to Lichen Products'. (University of North Carolina: Chapel Hill, N.C.)
Culberson, C. F. (1972). Improved conditions and new data for the identification of lichen products by a standardised thin-layer chromatographic method. *J. Chromatogr.* 72: 113–125.
Huovinen, K. & Ahti, T. (1982). Biosequential patterns for the formation of depsides, depsidones and dibenzofurans in the genus *Cladonia* (lichen forming ascomycetes). *Annls. bot. fenn.* 19: 225–234.
Laundon, J. R. (1984). The typification of Withering's neglected lichens. *Lichenologist* 16: 211–239.
Martin, W. (1958). The Cladoniaceae of New Zealand. *Trans. R. Soc. N.Z.* 85: 603–632.
Thomson, J. W. (1967). 'The Lichen Genus *Cladonia* in North America'. (University of Toronto: Toronto.)

Manuscript received 11th September 1987.

EUCALYPTUS CADENS (MYRTACEAE), A NEW SWAMP GUM FROM THE WARBY RANGE, NORTH-EAST VICTORIA

by

J. D. Briggs[1] and M. D. Crisp[2]

ABSTRACT

Briggs, J. D. and Crisp, M. D. *Eucalyptus cadens* (Myrtaceae), a new swamp gum from the Warby Range, North-East Victoria. *Muelleria* 7 (1): 7–13 (1989). — A new eucalypt, known only from a single locality in the Warby Range in NE. Victoria, is described and named. It is related to the Swamp Gums (the informal *E.* subser. Ovatinae), particularly *E. aggregata* Deane & Maiden, but is readily distinguished by its glaucous new growth. Often mature trees lean or fall over but continue to thrive in their boggy habitat which surrounds permanent springs.

INTRODUCTION

The first record of this species appears to be a collection made in 1979 by Mr A. C Beauglehole and Miss C. D. Nason on the late Miss Nason's property in the Warby Range. The same collectors obtained more material in 1985, and subsequently the population was listed by Beauglehole (1986) under the name *E. yarraensis* Maiden & Cambage. Miss Nason had also mentioned the existence of this unusual eucalypt to Mr J. L. Briggs, a local beekeeper, who recently visited the site and sent specimens to one of us (J. D. Briggs, his nephew) for identification. As the specimens did not match any species known to us, we undertook further investigations including field studies, collection of additional specimens and the growing of seedlings. The distinctiveness of the population combined with a lack of segregation in the seedlings convinced us that this was a new species. In this paper, we describe and name the new eucalypt and discuss its affinities and conservation status.

TAXONOMY

Eucalyptus cadens J. Briggs & Crisp, sp. nov.

E. aggregata Deane & Maiden arte simulans sed surculis manifeste glaucis, foliis maturis glaucescentibus, cortice pro parte maxima laevi praeter in parte inferna trunci differt.

Holotypus: Victoria, eastern foot of the Warby Range, between Wangaratta and Glenrowan, *J. D. Briggs 2068 & J. L. Briggs*, 8.x.1986, 2 sheets (CANB 370885-6). Isotypi: CBG, HO, MEL, NSW.

Spreading *tree*, often leaning, or fallen and continuing to grow from existing shoots as well as producing new vertical stems from the old trunk; standing trees 8–25 m tall, to 1 m d.b.h.; forming a lignotuber; bark smooth, decorticating in short ribbons, greenish grey above a 1–10 m hard, dark-grey, finely furrowed stocking; oil glands abundant in bark; new shoots and leaves glaucous, weathering to grey-green at maturity; crowns frequently containing mostly intermediate leaves. *Cotyledons* bilobed. *Seedling leaves* decussate to 5th–7th node, subsessile, spreading, elliptic to oblong, mostly narrow, slightly concave above, obtuse or rounded at apex, abruptly tapered at base, 10–50×3–22 mm, grey-green; *juvenile leaves* (above 12th node) similar but not opposite, ascending, narrow-elliptic to linear, ± acute, more tapered at base, glaucescent; seedling stems terete, red. *Intermediate leaves* petiolate (1–5 mm), narrow-elliptic to elliptic, ± flat, acute or obtuse, to 200×65 mm, conspicuously glandular; late intermediate leaves narrow-ovate to elliptic, to 150×34 mm including petiole to 20 mm. *Adult leaves* mostly pendulous, narrow-elliptic, slightly falcate, tapering to both ends (often abruptly to apex), 70–115×9–20 mm including 5–14 mm

[1] CSIRO, Division of Plant Industry, P.O. Box 1600, Canberra, A.C.T., Australia 2601.
[2] Australian National Botanic Gardens, P.O. Box 1777, Canberra, A.C.T., Australia 2601.

petiole, with abundant oil glands; midrib prominent, venation obscure, intramarginal vein *c.* 0·75 mm from leaf margin. *Unit inflorescences* one per axil, 7-flowered; peduncles terete to slightly angular, 4–6 mm long, *c.* 1 mm thick. *Buds* broad-fusiform, up to 8×3 mm including 0·5–2 mm pedicel; *hypanthium* obconical, *c.* 3×3 mm, slightly contracted at base; *inner operculum* conical, slightly beaked, about equal in length and fractionally narrower than hypanthium; *outer opercululm* shed early and intact, leaving scar. *Stamens*: filaments inflexed in bud, white; anthers versatile, obovoid, opening in vertical slits, *c.* 0·6 mm long. *Ovary* with 3 or 4 locules; ovules in 4 longitudinal rows on lower part of placenta; style clavate, 2·5–3 mm long; stigma blunt with a lobed surface, papillae short. *Fruit* densely clustered and appearing sessile, very broadly obconical, slightly contracted at base, 3·5–4·5×4·6–6 mm; pedicel 0–1·5 mm long; disc slightly raised, narrow (*c.* 0·5 mm wide); valves opening widely, exserted, 0·5–1 mm, rarely level with rim. *Seed* irregularly ellipsoid, depressed, smooth-edged, 1·0–1·7 mm long, 0·6–1·0 mm broad, *c.* 0·3 mm thick, shallowly reticulate, dullish-black, hilum ventral. (Figs 1–2).

Flowering Period:
Late March to early May.

Etymology:
The specific epithetic is from the Latin verb *cadere*, to fall down, and refers to the tendency of mature trees to lean or fall over in their boggy habitat.

Distribution:
Known only from a single locality in the Warby Range of North-East Victoria where two stands, one of about 550 trees and the other of 45 trees, survive on 5 hectares of private property around the margins of two permanent springs.

Other Specimens Examined:
Victoria — Eastern foot of the Warby Range about 6 km N. of Glenrowan, 9.xi.1985, *A.C. Beauglehole 81544 & C.D. Nason* (MEL); iv.1986, *J.L. Briggs 1, 2, 3 & C.D. Nason* (CANB, CBG, MEL); 8.x.1986, *J.D. Briggs 2065 & J.L. Briggs* (CANB, CBG, MEL, NSW); 8.x.1986, *J.D. Briggs 2069 & J.L. Briggs* (AD, CANB, CBG, HO, MEL, MELU, NSW); 8.x.1986, *J.D. Briggs 2070 & J.L. Briggs* (CANB, CBG); 30.xii.1986, *J.D. Briggs 2166 & J.L. Briggs* (AD, CANB, CBG, HO, MEL, MELU, NSW); 30.xii.1986, *J.D. Briggs 2168 & J.L. Briggs* (CANB, CBG, HO, MEL, NSW); *J. Chappill* 493, 494, 495, and seedlings grown from these (MELU).

Habitat:
The population of *E. cadens* is at the eastern foot of a steep hill on the very gently sloping floor of an open valley. There, it grows in seasonally waterlogged and permanently moist conditions in an area surrounding perennial springs. The soil is a grey sandy-clay loam overlying white gravelly clay. *Eucalyptus cadens* forms an almost pure stand in an open-forest/woodland community, where over half of the trees either have a significant lean or have fallen completely but continue to grow. A few specimens of *E. blakelyi* Maiden are scattered through the stand and about 5 trees of a form of *E. camphora* R. Baker occur in one edge of the larger stand. The understorey is predominantly a dense sedge and grass sward dominated by *Carex appressa* R. Br. and *Juncus* sp. (probably *J. sarophorus* L. Johnson), but with scattered shrubs of *Acacia melanoxylon* R. Br., *Leptospermum juniperinum* Smith and *Viminaria juncea* (Schrad & Wendl.) Hoffsgg. also present.

The slopes surrounding the site support *E. blakelyi* – *E. bridgesiana* R. Baker – *E. polyanthemos* Schauer – *E. albens* Benth. – *E. macrorhyncha* F. Muell. – *E. melliodora* Cunn. ex Schauer woodland and the adjacent flat areas have been heavily cleared and converted to pasture.

Conservation Status:
Endangered, coded 2E (criteria from Leigh *et al.* 1981). *Eucalyptus cadens* is known only from the one locality where about 600 trees occupy a total area of about 5 ha on two private properties. The area is subject to cattle grazing which largely

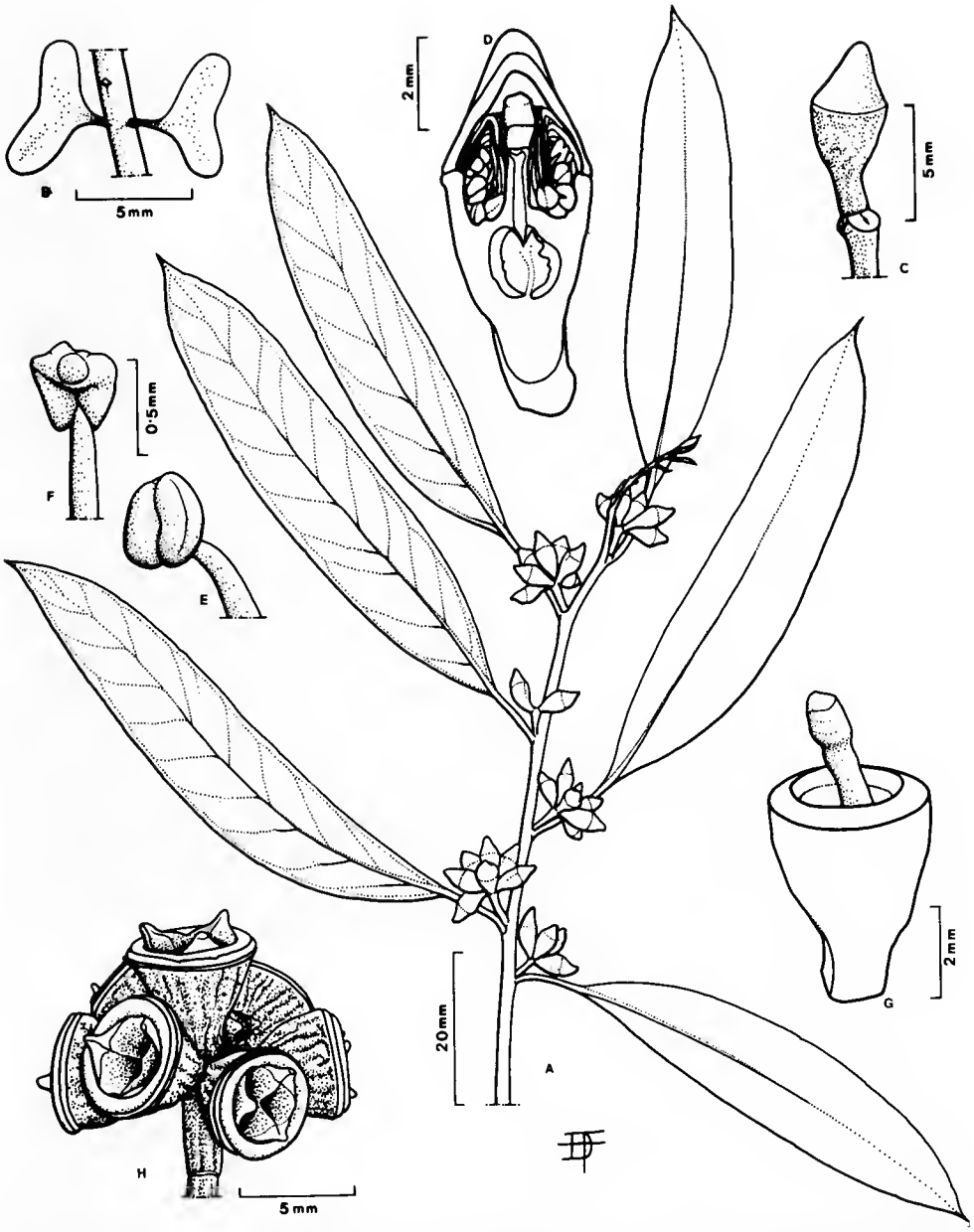

Fig. 1. *Eucalyptus cadens*. a — branchlet. b — cotyledons. c — bud. d — tangential longitudinal section of bud, showing inflexion of stamens. e — anther, anterior view. f — anther, posterior view. g — post-flowering hypanthium and style. h — unit infructescence. a,h from *J. D. Briggs 2068* (the type); c–g from *J. L. Briggs 2*; b from a living seedling, grown from *J. L. Briggs 2*.

prevents seedling regeneration. The stand occupies potential agricultural land and surrounds valuable permanent water supplies. There is a serious risk that much or all of the species could be cleared when the properties come under new ownership. The need for special protection of the species has become urgent in view of the recent death of Miss Nason who had been keen to preserve the large portion of the population which is on her land and whose family had owned the property since last century.

Fig. 2. *Eucalyptus cadens*. a — seedling, ex *J. L. Briggs 2*, showing gradation from elliptic seedling leaves to the distinctly narrower juvenile leaves. b — typical habitat with a few standing trees and the bushy crowns of several fallen specimens evident. c — a fallen tree continuing to thrive in its boggy habitat. The paler glaucous new growth is a distinctive feature of this species. d — rough persistent bark forming a stocking to 10 m at the base of the trunks. e — branches showing the smooth bark which decorticates in ribbons.

No similar springs supporting stands of *E. cadens* were known to Miss Nason or other long-term residents of the area. Whilst a few scattered individuals of *E. cadens* may survive on private property along the edge of the Warby Range, substantial stands are unlikely to be found in view of the very limited potential habitat and the extent to which clearing has already occurred in the area.

AFFINITY:

Eucalyptus cadens clearly belongs to the informal *E.* sect. Maidenaria (Pryor & Johnson 1971). The strongest supporting evidence is the presence of oil glands in the bark, a feature which has been found to be largely confined to species in *E.* sect. Maidenaria (Crisp 1988 and references therein). Additional support for this placement comes from the bilobed cotyledons, more or less sessile juvenile leaves (Boland *et al.* 1984) and general appearance of the species.

Within *E.* sect. Maidenaria, placement in the informal *E.* ser. Ovatae (Pryor & Johnson 1971) is suggested by the subsessile seedling leaves, as opposed to the strictly sessile seedling leaves of *E.* ser. Viminales. Moreover, *E. cadens* bears a close resemblance to the Swamp Gums (informal *E.* subser. Ovatinae Pryor & Johnson 1971), particularly with respect to the obconical fruit and swampy habitat.

Despite its close resemblance to the Swamp Gums, *E. cadens* is immediately distinguished by its glaucous new growth, which weathers to a grey-green colour at maturity. Under a dissecting microscope, the leaf cuticle has a dull appearance. None of the Swamp Gums develop glaucescence, and under the microscope their cuticle often appears somewhat lustrous. Nevertheless, there is little doubt that *E. cadens* is closely related to this group, and Table 1 presents some comparisons.

Eucalyptus cadens resembles *E. aggregata* more closely than any other species. At all developmental stages except very young seedlings, both these species, together with *E. rodwayi*, have narrower leaves than the other Swamp Gums (Table 1). They are particularly close in bud and fruit morphology. Interestingly, the isolated Victorian population of *E. aggregata* (at Woodend) shows the closest similarity to *E. cadens*, particularly in bud and fruit shape. Despite this similarity, *E. aggregata* may be readily distinguished from *E. cadens* by its shiny green leaves, persistence of rough bark to the small branches and more gradually tapered adult leaves.

Most authors (e.g. Johnson 1962; Pryor and Johnson 1979; Simmons 1985) regard *Eucalyptus rodwayi* R. Baker and H. G. Smith, a Tasmanian endemic, as being closely related to *E. aggregata.* It is distinguished from *E. cadens* using similar character differences to those exhibited by *E. aggregata.*

It has been suggested to us (J. Chappill, pers. comm.) that *E. cadens* may be closely related to *E. camphora* R. Baker, especially to the type population near Rylstone, New South Wales. In a current, uncompleted study, R. Coorey (pers. comm.) has recognised four taxa within *E. camphora.* Two of these are represented in Table 1: the type population, and the most southern form, which is the only form occurring in Victoria. A few trees of the latter are growing at one end of the *E. cadens* population. All four forms of *E. camphora* appear to be united as a natural group by the presence of emarginate intermediate leaves. Neither *E. cadens* nor any other Swamp Gum species shows this character (Table 1). All forms of *E. camphora* have, on average, longer pedicels than *E. cadens* (examples in Table 1). The Victorian form of *E. camphora* differs further from *E. cadens* by its very broad somewhat lustrous leaves. In the type population of *E. camphora*, the leaves are much narrower; nevertheless, they are broader than and differently shaped from those of *E. cadens*, especially at the intermediate stage (Table 1). We have examined Chappill's adult and seedling specimens (*Chappill 493–5*) and all except one segregate seedling (out of eighteen seen) fall within our circumscription of the species. In particular, the late juvenile leaves were typically narrow and there was no evidence of the broad, emarginate intermediate leaves that characterise *E. camphora.*

Beauglehole (1986) identified the population of *E. cadens* as '*E. yarraensis*'. However, the latter species does not appear to be so closely related. It differs in having rough bark persistent to the small branches, glossy green leaves which are considerably

Table 1. Comparison of *Eucalyptus cadens* with some other swamp gums

Characters	States in Taxa				
	E. cadens	*E. aggregata*	*E. camphora*[1]	*E. camphora*[2]	*E. yarraensis*
Bark	Smooth with up to 10 m of rough stocking	Rough to small branches	Smooth, sometimes with a short rough stocking	Smooth, sometimes with a short rough stocking	Rough to small branches
Glaucousness	Present on new growth	Absent	Absent	Absent	Absent
Juvenile leaf shape (above 12th node)	Narrow-elliptic to linear	Narrow-elliptic to linear	Elliptic, rarely narrow	Elliptic or ovate	Elliptic, oblong or ovate
Intermediate leaf shape	Narrow-elliptic to elliptic	Narrow-elliptic to elliptic	Elliptic or obovate	Broad-elliptic to orbicular	Broad-elliptic
Intermediate leaves emarginate (at least some)	−	−	+	+	−
Adult leaf shape	Narrow-elliptic	Narrow-elliptic or -ovate	Narrow-ovate	Elliptic or ovate	Narrow-elliptic or -ovate
Adult leaf apex	Abruptly tapered	Gradually tapered	Abruptly tapered	Abruptly tapered	Abruptly tapered
Adult leaf gloss	−	+	+	+	+
Hypanthium shape	Obconical	Obconical to hemispherical	Obconical	Obconical	Hemispherical to obconical
Pedicel length	0–1·5 mm	0·5–2 mm	1·5–3 mm	1·5–5 mm	0·5–3·5 mm

[1] Typical population, near Rylstone, New South Wales.
[2] Southern New South Wales/Victorian form.

broader at the intermediate stages, a more or less hemispherical hypanthium, and usually longer pedicels (Table 1).

There is a history of confusion between the Swamp Gums and the closely related *E. aromaphloia* Pryor & J. H. Willis (Simmons & Brown 1986). Recently, Chappill *et al.* (1986) have demonstrated that *E. aromaphloia*, as previously circumscribed, comprises four distinct taxa. However, the entire *E. aromaphloia* complex may be readily distinguished from *E. cadens* by its rough bark which extends to the small branches, manifestly attenuate adult leaf and hemispherical fruit with a strongly raised disc.

ACKNOWLEDGEMENTS

The authors wish to thank Mr J. L. Briggs for collecting specimens and drawing their attention to this new species and thank the late Miss Nason for her permission to study this species on her property. We also thank our colleagues Jennifer Chappill, Ken Hill, Lawrie Johnson and Lindsay Pryor for their comments. Mr D. Fortescue is thanked for his work in producing the line drawings of the new species. The work relating to the study and description of *E. cadens* was supported by grants from the Australian Heritage Commission and the Nell and Hermon Slade Trust.

REFERENCES

Beauglehole, A. C. (1986). *The Distribution and Conservation of Vascular Plants in the Murray Valley Area, Victoria.* (E. Davis and Sons: Portland, Victoria.)

Boland, D. J., Brooker, M. I. H., Chippendale, G. M., Hall, N., Hyland, B. P. M., Johnston, R. D., Kleinig, D. A. & Turner, J. D. (1984). *Forest Trees of Australia* 687 pp. (Nelson/CSIRO: Melbourne.)

Chappill, J., Ladiges, P. Y. & Boland, D. (1986). *Eucalyptus aromaphloia* Pryor & Willis — a redefinition of geographical and morphological boundaries. *Aust. J. Bot.* 34: 395–412.

Crisp, M. D. (1988). *Eucalyptus recurva* (Myrtaceae), a new species from the Southern Tablelands of New South Wales. *Telopea* 3(2): 223–230.

Johnson, L. A. S. (1962). Studies in the Taxonomy of *Eucalyptus. Contr. N.S.W. Nat. Herb.* 3(3): 105.

Leigh, J., Briggs, J. & Hartley, W. (1981). *Rare or Threatened Australian Plants.* Australian National Parks and Wildlife Service Special Publication No. 7, 178 pp.

Pryor, L. D. & Johnson, L. A. S. (1971). *A Classification of the Eucalypts.* (Australian National University Press: Canberra.)

Simmons, D. (1985). Observations on Disjunct Populations of *Eucalyptus aggregata* in Victoria and New South Wales with notes on the status of *E. rodwayi. Victorian Nat.* 103(4): 131–6.

Simmons, D. & Brown, G. (1986). The distribution of some *Eucalyptus* species (the Swamp Gums) in the Yarra Valley, Victoria. *Victorian Nat.* 103: 19–25.

Manuscript received 6 January 1988

AZORELLA Lamarck (APIACEAE) ON HEARD AND MACQUARIE ISLANDS, WITH DESCRIPTION OF A NEW SPECIES, *A. MACQUARIENSIS*

by

A. E. Orchard*

ABSTRACT

Orchard, A. E. *Azorella* Lamarck (Apiaceae) on Heard and Macquarie Islands, with description of a new species, *A. macquariensis*. *Muelleria* 7(1): 15–20 (1989). — *Azorella macquariensis*, a new species endemic to Macquarie Island has been recognized. Hitherto it had been confused with *A. selago* which occurs on Heard Island and several other subantarctic islands but not on Macquarie Island. A key, comparable descriptions, and illustrations of the salient features are provided for the two species, and some of the specimens examined are listed.

INTRODUCTION

Azorella is a genus of 33-70 (Allan 1961; Mathias & Constance 1971; Airy-Shaw 1973) species of perennial herbs, often mat or cushion-forming with their main centre of speciation in the Andes of South America, but with a few taxa extending to the Falkland and sub-Antarctic islands.

One of the most southerly, and the most widespread species is *A. selago*, described by Hooker (1845) from a number of specimens collected on the voyage of the 'Erebus' and 'Terror'. It seems that he relied mainly on material from Kerguelen Island collected by himself and Anderson in drawing up his description, but also had available specimens collected by Darwin from Tierra del Fuego, by King from Port Famine, and by himself from Hermit Island. At the end of the discussion he mentioned, almost as an after-thought 'I have also seen specimens sent from McQuarrie's Island by Mr. Frazer'. (The Hermit Island collection was subsequently chosen as lectotype by Moore (1968).) Consequently, from the beginning this species was perceived to be widespread and circumpolar in distribution. This opinion was reinforced by subsequent reports of *A. selago* from Marion Island, Crozet Island and Heard Island (summarised by Greene and Greene 1963) and from Prince Edward and McDonald islands (summarised by Greene & Walton 1975). Chastain (1958) described polymorphism in *A. selago* on Kerguelen Island, adding to the characterisation of the species as widespread and variable.

Recently, comparison of material from Heard and Macquarie Islands has convinced me that two taxa are involved. While Heard Island specimens clearly match Hooker's original description and illustration, modern descriptions of Fuegian and Falkland Island plants (Moore 1968, 1983) and specimens from Kerguelen Island, the Macquarie Island plants can be distinguished by a number of characters, principally of the leaves, but also of the inflorescence and fruit. This species is described below, along with a comparable account of *A. selago*.

Key to the Species of Azorella on Heard and Macquarie Islands

1. Leaf lamina 3(–5)-lobed, the lobes divided ± to the base, acute, pungent with a long setose point; wings of the petiole reduced to a truncate ridge at the base of the lamina; flowers solitary or sometimes paired; fruits up to 1·7 mm long, hidden in upper leaves, sepals ± deciduous ..... 1. *A. macquariensis*
1. Leaf lamina (4–) 5–6(–7)-lobed, the lobes divided only halfway to the base, blunt, with at most a tiny mucro; wings of the petiole produced into auricles at the base of the lamina; flowers usually in groups of 3; fruits 1·7–2·0 mm long, at least $\frac{1}{2}$-exserted from the leaves on pedicels 2 mm long, sepals persistent. 2. *A. selago*

*Tasmanian Herbarium, G.P.O. Box 252C, Hobart, Tasmania, Australia 7001.

1. **Azorella macquariensis** Orchard, sp. nov.

Azorella selago auctt. non J. Hooker (1846): J. Hooker, Fl. Antarc. 2(1846) 284–5(quoad specimen Frazeris); Cheeseman, Vasc. Fl. Macq. Is. (1919) 26; Taylor, Fl. Veg. Soils Macq. Is. (1955) 128–30; Allan, Fl. New Zeal. 1(1961) 451–2; Copson, Atlas Vasc. Fl. Macq. Is. (1984) 37; and all other references to '*A. selago*' in so far as Macquarie Island is concerned.

ILLUSTRATIONS: Taylor, Fl. Veg. Soils Macq. Is. (1955) Pl. 16, 17, 18, 29 (as *A. selago*).

Herbae perennes pulvini formantes. *Folia* alterna arcte imbricata; petioli 3–4(–10) mm longi, late alati, vaginantes, jugo incrassato truncato ad apicem; lamina 3(–5)-partita, lobis lanceolatis liberis fere basi acutis acumine setoso, glabra vel sparsim setosa in superficie. *Flores* solitarii, interdum binati, hermaphroditi. *Fructus* cinnamomei, 1·3–1·7 mm longi, inter folia supera occulta, stylis persistentibus, sepalis ± deciduis. (Fig. 1).

TYPUS: Macquarie Island, Pyramid Lake, north side, in *Azorella/Festuca/ Rhacomitrium crispulum* fellfield, alt. 190 m, 4.xi.1981, *R. D. Seppelt 12039.* HOLOTYPUS: HO 67713.

Perennial herb forming extensive tight mats, cushions, or in exposed situations, buttons; main branches prostrate, woody, to 5 mm in diameter; lateral shoots erect, herbaceous, freely branched, crowded, 3–5(–15) cm tall clothed in the remains of old leaves. *Leaves* alternate, closely imbricate and appressed to stems, persistent; petioles white, 3–4(–10) mm long, thickened at the apex, 3(–5)-veined, with a membranous wing outside the veins, the wings fused to form a sheath around the stem in the lower $\frac{1}{4}$–$\frac{1}{2}$ and produced above to form a very short truncate ridge-like 'ligule' at the base of the lamina; lamina 3(–5)-partite, the lobes divided almost to the base in young leaves, lanceolate, 1·7–2·0(–4·0) mm long, 0·6–0·9(–1·4) mm wide, thick and subfleshy, acute with a terminal setose apiculum, thickened margins, glabrous or with 1–3(–5) bristle-like hairs 1·4–4·0 mm long on the adaxial surface. Flowers terminal, solitary or sometimes paired, hermaphrodite, peduncles short with the flowers enclosed by the upper leaves. *Involucral* bracts 2, fused at the base to form a small cup, leaf-like or lanceolate. *Sepals* 5, white, linear, 0·5–0·9 mm long, unequal. *Petals* 5, pale reddish-brown, 1·5–2·0 mm long, incurved, slightly hooded, acute. *Stamens* 5, 1·7–3·0 mm long. *Styles* 2, 0·75–1·0 mm long, with a swollen stylopodium at the base. *Ovary* slightly laterally compressed. *Fruit* yellow-brown, ± sessile or on a pedicel to 1 mm long and therefore hidden amongst the upper leaves; body of fruit obovoid and slightly flattened laterally, 1·3–1·7 mm long, 1·0–1·5 mm wide, 0·9–1·0 mm thick, weakly ribbed; styles persistent, sepals ± deciduous.

This species is confined to Macquarie Island where it dominates the feldmark community and other exposed windswept situations, forming extensive cushions and tight mats. Flowering occurs from December to February and fruiting from January to April. A detailed account of the ecology of the species is given by Taylor (1955), of the process of cushion formation by Ashton and Gill (1965) and of detailed distribution by Copson (1984), all under the name *A. selago.*

SELECTED SPECIMENS EXAMINED (total 40):

Macquarie Island — 'Featherbed' terrace, 7.xii.1948, *Laird s.n.* (AD, AK, BISH, CHR, HO 86261, MEL); eastern side of Sawyer Creek Valley, 21.i.1981, *Seppelt 11939* (HO); north side of Pyramid Lake, 4.xi.1981, *Seppelt 12039* (HO); SW. side of Green Gorge, 4.i.1982, *Seppelt 12390* (HO); near Flynn Lake, 29.xi.1950, *Taylor s.n.* (MEL 689443); Gadgets Gully, 3.ii.1951, *Taylor s.n.* (MEL 689445); North Mt, 4.iii.1951, *Taylor s.n.* (MEL 689450); Plateau, xi.1976, *Tyler s.n.* (HO 30818).

NOTES:

This species is most obviously distinguished from *A. selago s.str.* by its small size and by the shape of its leaves. Upper (current year) leaves of *A. macquariensis* are usually 3-lobed with the lamina divided almost to the base, and the lobes are acute and bristle-tipped. In lower, older, leaves the bristle may be lost but the lobes remain ± acute, rather than blunt and rounded as in *A. selago.* In particularly robust plants or those growing in shaded places the leaves are larger and sometimes up to

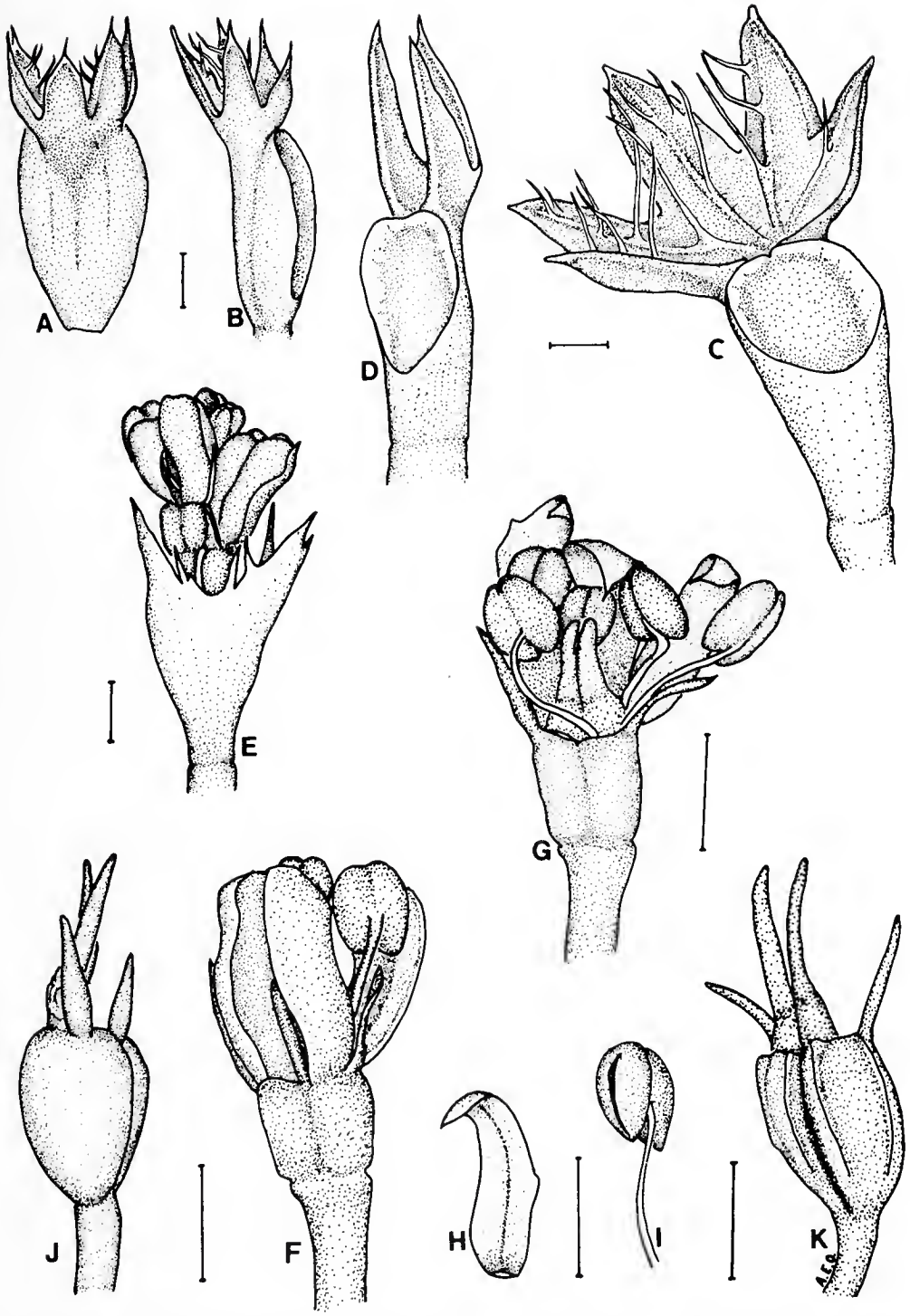

Fig. 1. *Azorella macquariensis*. A — Young 5-lobed leaf, abaxial view. B — The same, lateral view. C — Older leaf from a robust (?shaded) branch, adaxial view, stem removed to show sheath and 'ligule'. D — Young 3-lobed leaf, glabrous form. E — Inflorescence showing a pair of flowers in an involucral cup. F — Flower at anthesis. G — The same, 2 petals removed. H — Petal. I — Stamen. J — Fruit, dorsal view, 2 sepals still attached. K — The same, commissural view. (A–C, E from *Seppelt 12039*; D, F–I from *Tyler s.n.*, HO 30818; J, K from *Taylor s.n.*, MEL 689445; all bar scales represent 1 mm.)

5-lobed, resembling those of *A. selago*, but the species can still be distinguished by the characters of the tips of the leaf lobes, and also by the shape of the 'ligule'. This is formed as a prolongation of the membranous wings of the petiole. In *A. macquariensis* the 'ligule' is short, little more than a ridge, and truncate or slightly rounded. In *A. selago s.str.* it consists of two distinct, rounded auricles. There are also supporting differences in the flowers and fruits. In *A. macquariensis* the flowers are typically solitary at the tips of the new shoots, sometimes paired, whereas in *A. selago* they are borne in groups of three. Taylor (1955) mentioned that 'ripe seeds are shed from January to April' in the Macquarie Island species, without further comment. However, fruits are very scarce on existing collections. It is not clear whether this reflects a failure of fruit formation or whether fruits in this species are shed rapidly and easily, not surviving on herbarium specimens. The few surviving fruits are hidden amongst the upper leaves on short pedicels and very difficult to find. On *A. selago* on the other hand fruits seem to set readily and persist for some time on the plants. Their peduncles elongate and they are held at least half exserted and often fully exserted above the upper leaves. The sepals in *A. selago* persist on the fruit, while those of *A. macquariensis* are mostly shed.

2. **Azorella selago** J. Hooker, Flora Antarctica 2 (1845) t. 99, (1846) 284.

[Typus: 'Tierra del Fuego, south part, C. Darwin, Esq. Port Famine, Capt. King. Hermit Island, towards the top of the mountains, J.D.H. Kerguelen's Land, covering the ground near the sea, Anderson, J.D.H.'. Lectotypus (Moore 1968): *Hooker 8*, Tierra del Fuego, Isla Hermite, K (n.v.) Syntypi (?): Anon. ('Erebus' & 'Terror' Exped.), Cape Cumberland, Kerguelen Is., 1840 (HO 108900 p.p.). — Anon. ('Erebus' & 'Terror' Exped.), Christmas Harbour, Kerguelen Is., 1840 (HO 108899 p.p.).] Chastain, Fl. Veg. Iles Kerguelen (1958) 89–91; Moore, Vasc. Fl. Falkland Is. (1968) 94; Greene & Walton, Polar Record 17 (1975) 473–84; Moore, Fl. Tierra del Fuego (1983) 175–6.

Illustrations: J. Hooker, Fl. Antarct. (1845) Pl. 99; Chastain Fl. Veg. Iles Kerguelen (1958) Pl. 2,3,23: Moore, Vasc. Fl. Falkland Is. (1968) Fig. 14c.

Perennial herbs forming extensive tight mats and cushions; main branches ± prostrate, woody, 2–3 mm in diameter; lateral shoots erect, herbaceous, freely branched, crowded, 3–15 cm tall, clothed in the remains of old leaves. *Leaves* alternate, closely imbricate and appressed to the stems, persistent; petioles white, 3·3–5·0(–10) mm long with 5 longitudinal veins, the outermost weak, with a membranous wing outside the veins, the wings fused in the lower ¼–½ to form a sheath around the stem and produced above into free auricles at the base of the lamina; lamina ± reniform, 2·1–4·2(–6·7) mm in radius, very thick, leathery, divided to about ½ (or less) of its depth into (4–)5–6(–7) lobes; lobes blunt, tips rounded or with at most a tiny blunt apiculum (outermost lobes sometimes acute or long-apiculate), ± flat on abaxial face, distinctly keeled on adaxial face, with thickened margins, glabrous or with a few coarse bristles 1·5–2·0(–3·0) mm long on adaxial surface, arising from the veins. *Flowers* terminal, in groups of 3, ± enclosed by the upper leaves. *Involucral bracts* 2, lobed, leaflike, fused at the base to form a small cup. *Sepals* 5, deltoid, 0·4–0·6 mm long, 0·4 mm wide, spreading, weakly midribbed. *Petals* 5, 1·5–1·7 mm long, incurved, slightly hooded. *Stamens* 5, 2·0 mm long. *Styles* 2, 1·1–1·8 mm long, curved, with a swollen stylopodium at the base. *Ovary* ovoid, *c.* 2 mm long. *Fruit* olive-brown to yellow-brown, on a pedicel 2 mm long, at least ½-exserted from the upper leaves; body of fruit ovoid to obovoid, slightly flattened laterally, 1·7–2·0 mm long, 1·3–2·0 mm wide, 1·3 mm thick, weakly ribbed; styles and sepals persistent. (Fig. 2).

Extends from Tierra del Fuego to Falkland, Marion, Crozet, Kerguelen and Heard Islands. In Tierra del Fuego it is found in feldmark communities from 450–1100 m (Moore 1983). On Kerguelen Island the species grows in similar habitats, but at lower altitudes (Chastain 1958). On Heard Island it is the dominant species,

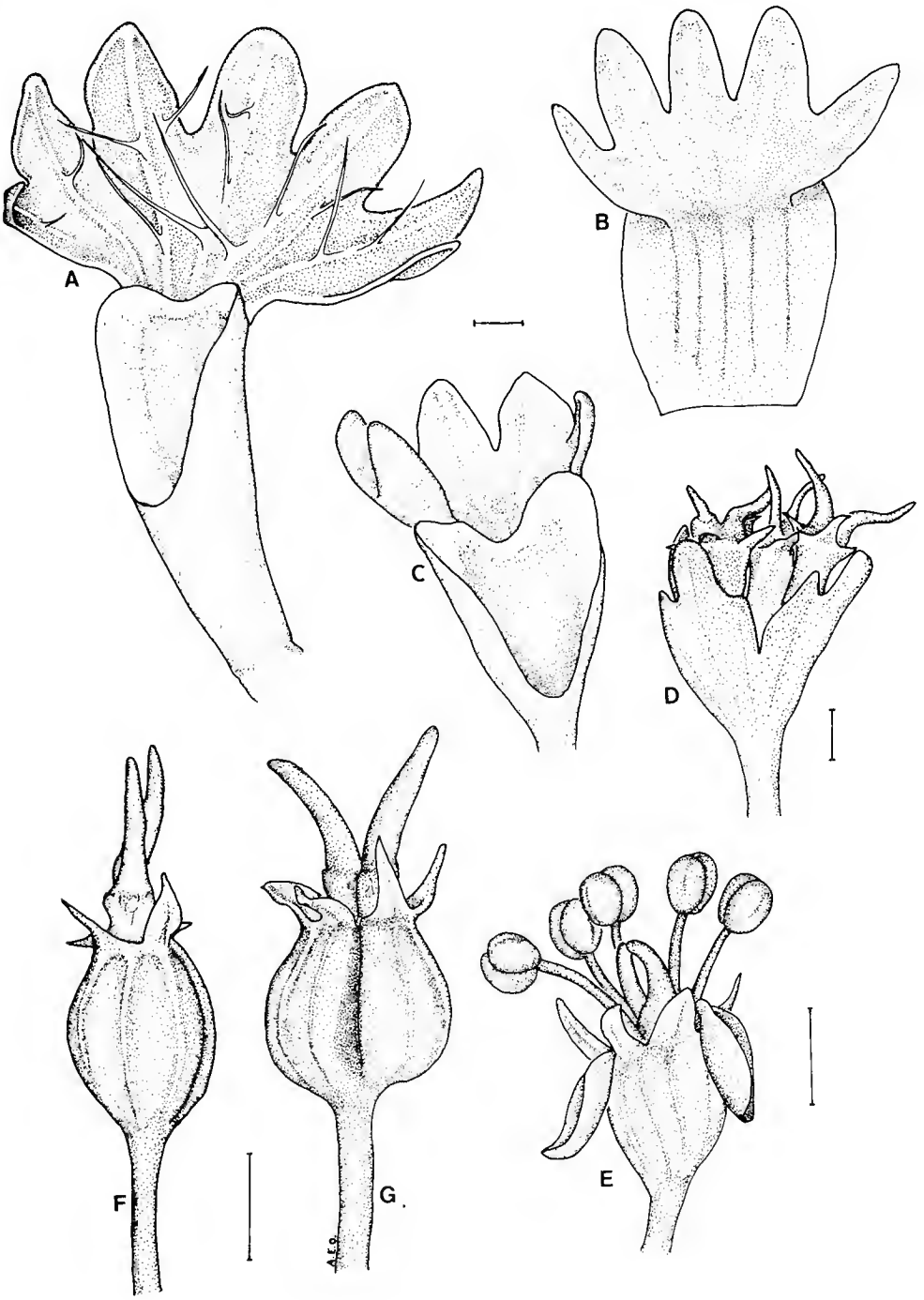

Fig. 2. *Azorella selago*. A — Leaf with bristles, adaxial view, stem removed to show sheath and 'ligule'. B — Leaf, glabrous form, abaxial view, sheath split and flattened. C — The same, adaxial view. D — Inflorescence showing group of 3 old flowers/young fruits in involucral cup. E — Flower. F — Fruit, dorsal view. G — The same, commissural view. (A, D, F, G from *McGregor 12*; B, C, E from *Bratt P7*; all bar scales represent 1 mm.)

abundant on all rocky sites between the limit of seaspray and *c.* 100 m (*Smith 770*).

SPECIMENS EXAMINED:

Kerguelen Island — Point Molloy, 16.ii.1971, *Bratt P6* (HO); foothills of Chateau Range, 17.ii.1971, *Bratt P7 & P8* (HO); Hill of the Drumlins, 15.iii.1971, *Bratt P21* (HO).

Heard Island — Old ANARE Station, Atlas Cove, 12.iii.1983, *Copson 103*; Atlas Cove, 8.ii.1963, *Filson 4596* (HO); Spit Bay, ii.1950, *Kenny s.n.* (MEL 1554181); Atlas Cove, 20.ii.1983, *McGregor 12* (HO); Skua Bay, 23.xii.1986, *Scott s.n.* (HO 104164); Fairchild Beach, 23.xii.1986, *Scott s.n.* (HO 104165); Atlas Cove, behind ANARE base, 20.i.1987, *Scott s.n.* (HO 104163); near former ANARE base camp, Atlas Cove, 8.ii.1983, *Smith 770* (HO).

ACKNOWLEDGEMENTS

I am grateful to Jenny Scott for the collection of *Azorella* and other genera on Heard Island during the 1986/87 expedition, and to Dr R. D. Seppelt for earlier collections of *Azorella* from Macquarie Island. The Australian Biological Resources Study supported the curation of the important Laird collection of Macquarie Island plants, and Dr J. H. Ross (MEL) kindly arranged the loan of the Taylor specimens.

REFERENCES

Air Shaw, H. K. (ed.) (1973). J. C. Willis, 'A Dictionary of the Flowering Plants and Ferns', 8th edn. (University Press: Cambridge.)

Allan, H. H. (1961). 'Flora of New Zealand', vol. 1. (Government Printer: Wellington.)

Ashton, D. H. & Gill,, A. M. (1965). Pattern and process in a Macquarie Island feldmark. *Proc. Roy. Soc. Victoria* 79: 235–245.

Chastain, A. (1958). La Flore et la Végétation des Iles de Kerguelen. Polymorphisme des espèces australes. *Mem. Mus. Nat. Hist. Nat., Bot.* 9: 1–136.

Copson, G. R. (1984). An annotated atlas of the vascular flora of Macquarie Island. *ANARE Research Notes* 18: 1–70.

Greene, S. W. & Greene, D. M. (1963). Check list of the sub-Antarctic and Antarctic vascular flora. *Polar Record* 11: 411–418.

Greene, S. W. & Walton, D. W. H. (1975). An annotated check list of the sub-Antarctic and Antarctic vascular flora. *Polar Record* 17: 473–484.

Hooker, J. D. (1845–6). Flora Antarctica. II. t. 99 & pp. 284–285, *in* The Botany of the Antarctic Voyage of H.M. Discovery Ships 'Erebus' and 'Terror'. (Reeve: London.)

Mathias, M. E. & Constance, L. (1971). Umbelliferae, in Lasser, T., 'Flora de Venezuela', Vol. 3, pp. 93–168. (Instituto Botanico: Caracas.)

Moore, D. M. (1968). The vascular flora of the Falkland Islands. *British Antarc. Surv. Sci. Rep.* 60: 1–202.

Moore, D. M. (1983). 'Flora of Tierra del Fuego'. (Nelson: Oswestry & Missouri Botanical Garden: St. Louis.)

Taylor, B. W. (1955). The flora, vegetation and soils of Macquarie Island. *ANARE Rep., Bot.* 2: 1–192.

Manuscript received 1 March 1988

NOTES ON *HOVEA* R. Br. (FABACEAE): 2

by

J. H. Ross*

ABSTRACT

Ross, J. H. Notes on *Hovea* R. Br. (Fabaceae): 2. *Muelleria* 7(1): 21–38 (1989). The six Western Australian species of the endemic Australian genus *Hovea* are revised. Descriptions, a key to the identification of the species, illustrations, and distribution maps are provided, together with notes on ecological preferences and relationships.

INTRODUCTION

The genus *Hovea* is represented in Western Australia by six species which are distributed largely within the South-West Botanical Province as defined by Beard (1980) with outliers in the Coolgardie Botanical District of the South-Western Interzone. The Western Australian species are isolated geographically from the remaining species in the genus and none is allied closely to any of the eastern or the northern species. Some specimens of *H. trisperma* with narrow leaves are superficially similar to specimens of *H. linearis* (Sm.) R. Br. from New South Wales but the two differ in many significant respects. In contrast to the eastern species, the Western Australian species are relatively straightforward taxonomically.

The Western Australian species do not form a homogeneous group and, apart from the obvious close relationship that exists between *H. stricta* and *H. pungens*, their affinities are not obvious. Some of the xeromorphic adaptations exhibited in the Western Australian species such as the rigid pungent-pointed leaves of *H. pungens* and *H. stricta*, the coriaceous leaves with sinuate prickly-toothed margins of *H. chorizemifolia*, and the short lateral spine-tipped shoots and minute leaves of *H. acanthoclada* are not found elsewhere in the genus.

The flowers of the Western Australian species are a deep intense blue or purplish-blue (except for the occasional white-flowered variants which occur throughout the range of the genus) in contrast to those of the eastern species which are usually a paler purplish-blue, pinkish-purple or insipid mauve. The inner surfaces of the pod valves of many of the eastern species are pubescent whereas those of the Western Australian species are all glabrous.

KEY TO THE WESTERN AUSTRALIAN SPECIES

1. Branches armed with short lateral spreading spine-tipped leaf-bearing shoots; leaves minute, up to 7 mm long ..... 1. *H. acanthoclada*
1. Branches lacking spine-tipped shoots; leaves larger than above:
   2. Leaves rigid, the margins usually strongly revolute and apices mostly pungent-pointed:
      3. Leaves sessile or on petioles up to 0·5 mm long, typically inserted on the branch at an angle of more than 45° and almost at right angles to it, the lamina arching outwards or spreading laterally and often slightly reflexed; seeds mottled ..... 5. *H. pungens*
      3. Leaves on short but distinct petioles 0·75–1·5 mm long, typically inserted on the branch at an acute angle (less than 45°) the lamina arching outwards and upwards with the apex pointing towards the apex of the branch; seeds uniform yellowish or olive-brown ..... 6. *H. stricta*

*National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

2. Leaves scarcely or distinctly coriaceous but not rigid, margins not strongly revolute, apices not pungent-pointed, or, if so, then margins usually sinuate and prickly-toothed:
   4. Leaf margins usually distinctly sinuate and pungent-pointed, occasionally almost entire and almost lacking teeth but the upper stamen-filament free from the tube ..... 2. *H. chorizemifolia*
   4. Leaf margins entire, crisped or almost crenulate but not pungent-pointed, upper stamen-filament usually united to the tube:
      5. Subshrub to 0·6 m high, stems often weak and sprawling unless supported; exterior of calyx clothed with appressed to slightly spreading hairs, the hairs mainly silvery-white or sometimes with an understorey of shorter rust-coloured hairs; lower surface of leaf with appressed, spreading or asymmetrically biramate hairs, the hairs often crimped; ovules 2–7 ..... 3. *H. trisperma*
      5. Slender erect shrub or tree to 3 m high; exterior of calyx clothed with appressed hairs, the hairs all short and rust-coloured or sometimes with paler longer hairs interspersed; lower surface of leaf with predominantly or exclusively medifixed or asymmetrically biramate hairs; ovules 2 (very rarely 3 or 4) ..... 4. *H. elliptica*

1. **Hovea acanthoclada** F. Muell., Fragm. 4: 15 (1863); Benth., Fl. Austral. 2: 174 (1864). LECTOTYPE (here selected): Western Australia, Phillips River, *Maxwell s.n.* (MEL).

Daviesia? acanthoclada Turcz., Bull. Soc. Imp. Naturalistes Moscou 26: 262 (1853). LECTOTYPE (here selected): Western Australia, *Drummond 5th coll. No. 90.* (KW; ISOLECTOTYPE: BM, G, K, NSW, PERTH, W).

Rigid divaricate *shrub* to 2 m high, single or many-stemmed, armed with short lateral spreading spine-tipped shoots which bear leaves and inflorescences; branches densely clothed with appressed to slightly spreading antrorse hairs, some of which are often asymmetrically biramate. *Leaves* solitary or appearing fascicled in twos or threes; lamina oblong, narrow-obovate, ovate or rotund, 1·5–7 mm long, 0·9–2 mm wide, rounded, obtuse or retuse apically, with or without a short mucro, margins revolute, glabrous above, sparingly to densely clothed with appressed often asymmetrically biramate hairs below; petiole up to 0·5 mm long. *Inflorescence* axillary, sessile or on peduncles up to 1·2 mm long. *Flowers* solitary or paired, pedicellate, the pedicels 1·5–4 mm long, clothed with appressed hairs; bracteoles ± 1 mm long, inserted at the base of or a short distance below the base of the calyx, much shorter than the calyx-tube, pubescent like the pedicel and bract; bract ± 1 mm long, inserted 1–2 mm below the bracteoles. *Calyx* turbinate-campanulate, densely clothed with short appressed hairs; 2 upper lobes 4·5–5·5 mm long including the tube 3–3·5 mm long, ± truncate except for an acute tip; the lower 3 lobes 1·5–2·5 mm long. Standard 8–10·2 mm long, 8–10 mm wide, purplish-blue with a basal whitish horse-shoe shaped flare; wings 7–9 mm long, 2·9–3·7 mm wide, purplish blue; keel 5·7–6·5 mm long, 2·2–3 mm wide, purplish-blue apically, white basally. *Stamen-filaments* 4·5–6 mm long. *Ovary* 1·2–1·5 mm long, 2-ovulate, glabrous, on a stipe up to 1 mm long. *Pods* shortly stipitate, the stipe almost as long as the calyx, obliquely to transversely globular, ovoid or ellipsoid, 0·7–0·9 cm long, 0·9–1·1 cm wide, glabrous. *Seeds* elliptic, plump, 4–4·8 mm long, 2·3–3 mm wide, 2·2–2·7 mm thick, dark brown, aril extending for more than half the length of the seed (Fig. 1d–f).

Confined to southern Western Australia where there are two disjunct centres of distribution: one in the vicinity of Kalgoorlie and the other further south from the Fitzgerald River area to east of Ravensthorpe and southwards to Hopetoun (Fig. 2). Recorded from rocky outcrops, scree slopes, laterite and loam over granite in mallee, in tall *Eucalyptus* woodland and in association with *Acacia*, *Casuarina* and *Hakea* species.

REPRESENTATIVE SPECIMENS (total number examined 23):

Western Australia — Kalgoorlie, 16.viii.1963, *T. E. H. Aplin 2259* (PERTH); Mt Short, N. of Ravensthorpe, 30.viii.1963, *A. S. George 5711* (PERTH); E. side of Fitzgerald River valley, above Roes Rock, 18.xii.1970, *A. S. George 10552* (PERTH); 13 km S. of Ravensthorpe towards Hopetoun, 27.vii.1983, *G. J. Keighery 6223* (PERTH); 17 km due NE. of Ravensthorpe, near Woodenup Creek, 30.viii.1980, *B. R. Maslin 4773* (PERTH).

TYPIFICATION:

Turczaninow based his description of *Daviesia? acanthoclada* on *Drummond 5th coll. No. 90* and, as a description of the pods and seeds is included in the protologue, it is clear that he saw a fruiting specimen. It would appear reasonable to assume that the Drummond specimen that Turczaninow saw is the one housed in KW but the specimen in KW lacks pods and seeds; there is no means of knowing whether or not pods and seeds were present in Turczaninow's time and have since been lost or whether he examined a specimen with pods and seeds elsewhere. Specimens of *Drummond 5th coll. No. 90* in G (2 sheets), K (2 sheets), NSW, PERTH (ex K) and W bear pods and seeds. Despite the lack of pods and seeds, I here select the Drummond collection in KW as the LECTOTYPE of *D.? acanthoclada*, the collections in G, K, NSW, PERTH and W being treated as ISOLECTOTYPES.

NOTES:

Mueller, *Fragm.* 4: 15 (1863), based his description of *H. acanthoclada* as far as one can tell on a Maxwell collection from Phillips River. There is no reference by Mueller, either direct or implied, to the earlier name *Daviesia? acanthoclada* Turcz. based on *Drummond 5th collection No. 90.*

It has been customary to regard *H. acanthoclada* as a new combination by Mueller based on *Daviesia? acanthoclada* but *H. acanthoclada* Mueller is treated here as a new name as I believe that when Mueller described *H. acanthoclada* he thought that he was providing a name to a taxon that previously was without a name. Perusal of the pages of *Fragm. 4* following the description of *H. acanthoclada* shows that Mueller was meticulous about citing references to earlier published descriptions if he was aware that they existed. The absence of any reference whatsoever by Mueller to *D.? acanthoclada* therefore seems to be of significance.

Circumstantial evidence supports the view that Mueller was unaware of Turczaninow's earlier name. In the Appendix to the 1864–65 Annual Report as Director of the Botanic Gardens, *Bull. Soc. Imp. Naturalistes Moscou* is not listed by Mueller among the holdings of the library. It is probably unlikely that he would have omitted the journal from his list inadvertently. Records in the State Library of Victoria indicate that the journal was not acquired by the State Library prior to 1869 and there was no other library in Victoria likely to have contained the publication. There is no specimen of *Drummond's 5th collection No. 90* in MEL, so Mueller could not have seen a named collection. All of the incoming correspondence to Mueller was destroyed in the 1930s so there is no means of knowing whether he was aware of the name from that source.

Mueller's choice of the same specific epithet as Turczaninow does not seem to be too great a coincidence for credibility. The occurrence of spine-tipped branches occurs nowhere else in the genus so the presence of this character would suggest itself as a fairly obvious specific epithet. Furthermore, Mueller had used the same epithet for *Acacia acanthoclada* in *Fragm.* 3: 127 (1863) published shortly before *H. acanthoclada.*

H. acanthoclada differs from all of the other species in having spine-tipped branches and minute leaves. It is reminiscent of some of the xeromorphic *Bossiaea* species.

2. **Hovea chorizemifolia** DC., Prodr. 2: 116 (1825) (as *chorizemaefolia*); Sweet, Hortus Brittanicus 2: *addenda* 475 (1827); Lindley in Edwards's Bot. Reg. 18: t. 1524 (1832) (as *chorozemaefolia*); Benth., Fl. Austral. 2: 174 (1864).

Plagiolobium chorizemifolia (DC.) Sweet, Fl. Australasica t. 2 (1827); Meissn. in

Lehm., Pl. Preiss. 1: 80 (1844); Wheeler, Fl. Perth Region 268 (1987). LECTOTYPE (here selected): Western Australia, collector unknown, (G-DC).

H. ilicifolia Sweet, Hortus Britannicus 1: 111 (1826) *nomen nudum.*

Plagiolobium ilicifolium Sweet, Fl. Australasica t. 2 (1827) partly but excluding the pod; Meissn. in Lehm., Pl. Preiss. 1: 80 (1844). NEOTYPE: Western Australia, *Drummond 182* (MEL; ISONEOTYPE: BM, K, NSW, W).

H. ilicifolia Cunn. in Lindley, Edwards's Bot. Reg. 30: t. 58 (1844). LECTOTYPE (here selected): Western Australia, King Georges Sound, A. Cunningham (CGE).

Plagiolobium chorozemaefolium var. *subintegrum* Meissn. in Lehm., Pl. Preiss. 1: 80 (1844). SYNTYPES: Western Australia, between Greenmountain and Mahogany Creek, 12.ix.1839, *Preiss 1052* (HBG, K, LD, MEL, NY, W); Western Australia, *Drummond 181* (BM, K, MEL, NSW, W).

Plagiolobium chorozemaefolium var. *dentatum* Meissn. in Lehm., Pl. Preiss. 1: 80 (1844). LECTOTYPE (here selected): Western Australia, Mount Melville, 25.ix.1840, *Preiss 1058* (LD; ISOLECTOTYPE S).

Shrub or subshrub to 0·6 m high with one or several stems arising from the base, stems branched or sometimes simple, sparingly to densely clothed with appressed antrorse or spreading often rusty hairs, glabrescent. *Leaves*: lamina ovate, elliptic to lanceolate, those on lower leaves often shaped differently to those on upper leaves, margins usually distinctly sinuate and prickly-toothed but occasionally almost entire and almost lacking teeth, 1·5–8 cm long including a pungent point up to 0·6 cm long, 0·8–4 cm wide (including the teeth), coriaceous, glabrous throughout or with scattered hairs on lower surface of midrib and/or lamina, venation sometimes prominently reticulate; petiole 0·5–3·5 mm long. *Stipules* subulate, up to 4·5 mm long, 0·45 mm wide. *Inflorescence* axillary, sessile or on peduncles up to 1·5 mm long, 2–6 flowered. *Flowers* pedicellate, the pedicels 2–5 mm long, densely pubescent with long straightish hairs scattered in amongst shorter curled hairs; bracteoles subulate, up to 3·5×0·6 mm, inserted ± 1 mm below the calyx, pubescent when young but glabrescent; bract subulate, up to 3×0·6 mm, inserted 1–3·5 mm below the bracteoles. *Calyx* densely clothed with long straightish hairs and shorter curled or crinkled hairs; 2 upper lobes 5–6 mm long including the tube 2–2·5 mm long, up to 7 mm across, emarginate; the 3 lower lobes 1·2–2·5 mm long. *Standard* 10·4–14 mm long, 10–13 mm wide, purplish-blue with a basal whitish horse-shoe shaped flare; wings 8–9·5 mm long, 4–4·5 mm wide, purplish-blue; keel 4–7 mm long, 2·5–3 mm wide. *Stamen-filaments* 4–4·5 mm long, staminal sheath open on the upper side and sometimes also on the lower, upper filament usually free. *Ovary* sessile, 1–1·5 mm long, 2-ovulate, glabrous. *Pods* shortly stipitate, globular, ovoid or ellipsoid, 0·8–1·1 cm long, 0·8–1 cm wide, glabrous. *Seeds* elliptic, 4·5–5·5 mm long, 3·2–3·7 mm wide, olive-brown or brown, aril extending for more than half the length of the seed. (Fig. 1 g–i).

Confined to the Darling, Avon and Eyre Botanical Districts of the Southwestern Botanical Province of Western Australia as defined by Beard (1980) occurring from the vicinity of Bindoon north-east of Perth south-eastwards to York, Narrogin and the Bremer River north-east of Albany (Fig. 2). The label accompanying one specimen (MEL 667133) alleges that the specimen was collected by Maxwell in 1875 'near Cape Arid'. This is considerably further east than any other records of the species and suggests that the label may not belong with the specimen.

Recorded from laterite, gravel, granite outcrops, sand and in karri forests in sandy soils rich in organic matter. In the northern part of its range and in the Darling Range *H. chorizemifolia* often grows in association with *H. trisperma* whereas in the karri forests it is often associated with *H. elliptica.*

REPRESENTATIVE SPECIMENS (total number examined 246):

Western Australia — 5 km S. of Margaret River township on Caves Road, 28.x.1983, *M.G. Corrick 8966* (MEL); Bindoon, 3.ix.1964, *J. Galbraith 561A* (MEL). Dwellingup, 25.ix.1942, *C.A. Gardner 6484* (PERTH); Greenmount, Darling Range, 23.vii.1898, *A. Morrison* (AD, MEL, PERTH); Knoll Drive, Nornalup-Walpole National Park, 9.ix.1971, *S. Paust 346* (PERTH); York, 4.vi.1905, *O.H. Sargent* (NSW).

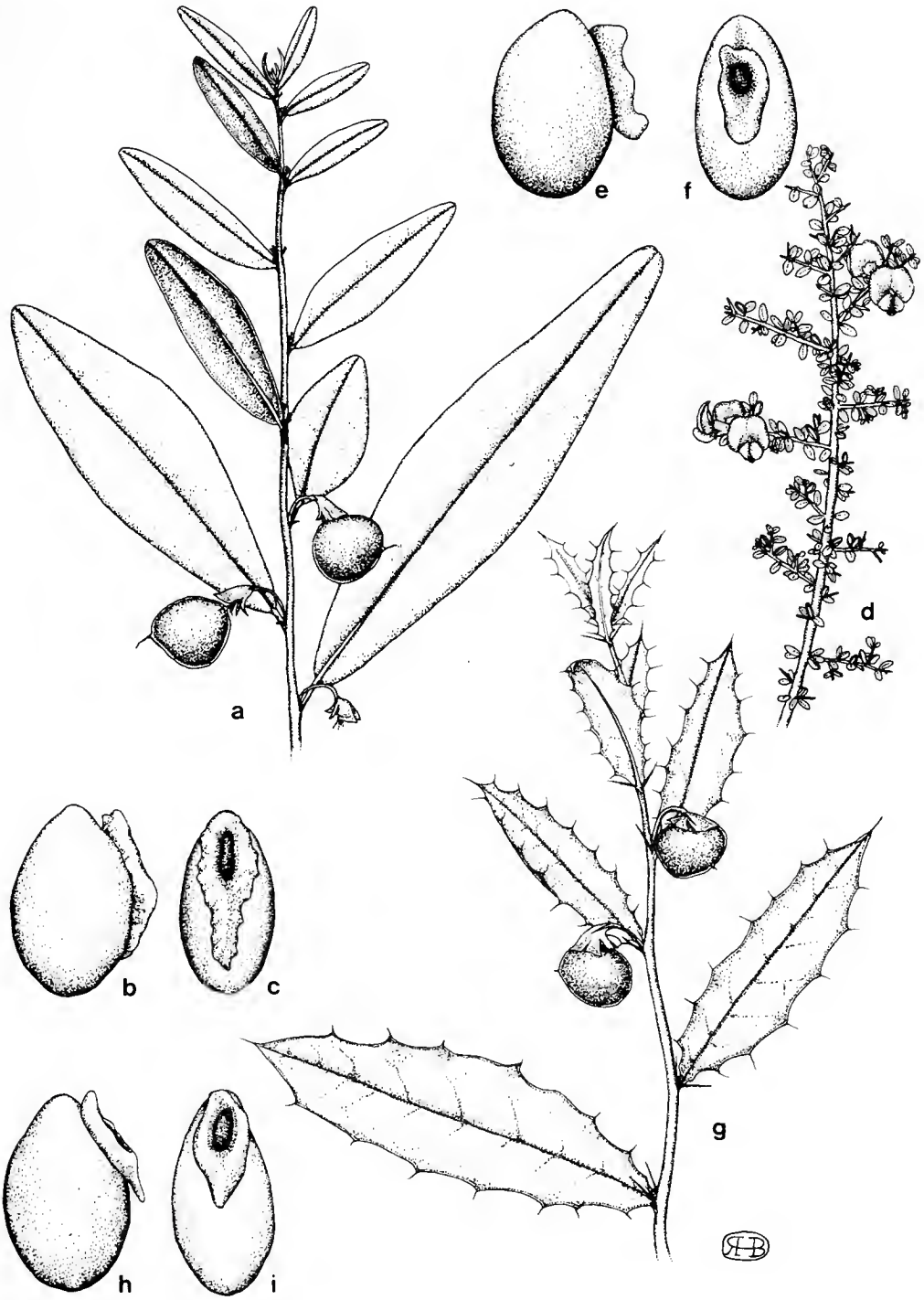

Fig. 1. *Hovea elliptica*. a — fruiting twig, × 1. b — seed, side view, × 6. c — seed, hilar view, × 6. *H. acanthoclada*. d — flowering twig, × 1. e — seed, side view, × 6. f — seed, hilar view, × 6. *H. chorizemifolia*. g — fruiting twig, × 1. h — seed, side view, × 6. i — seed, hilar view, × 6. a–c from *R.A. Kilgour 520* (MEL); d from *G.J. Keighery 6223* (PERTH); e–f from *A.S. George 10552* (PERTH); g from *M.G. Corrick 9597* (MEL); h and i from *F. Mueller s.n.* (MEL 667151).

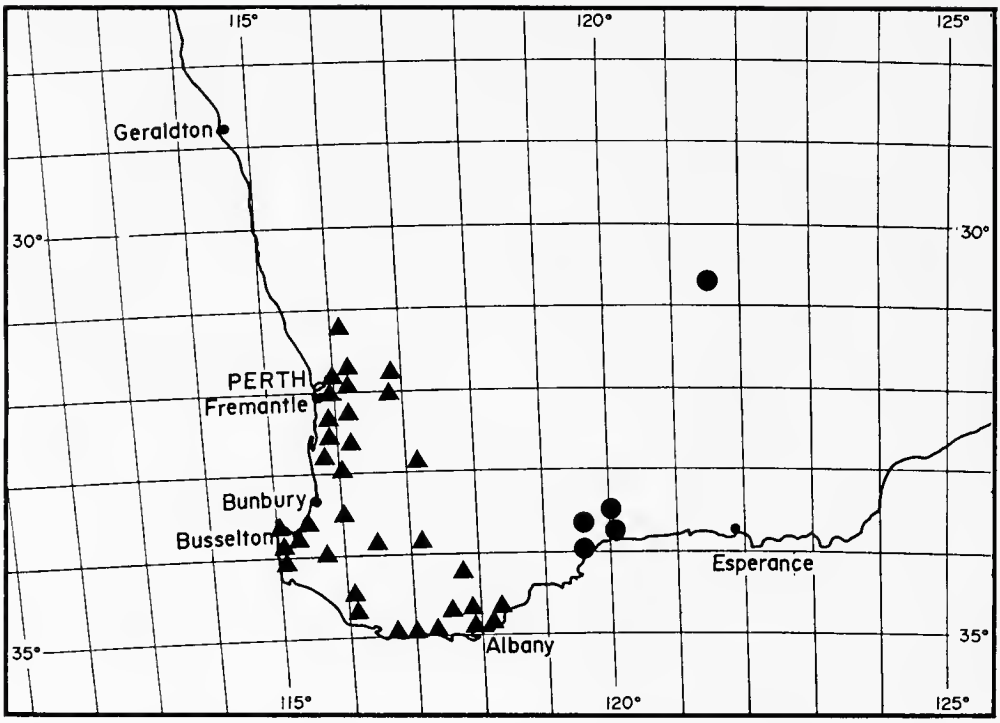

Fig. 2. The known distribution of *Hovea acanthoclada* (●) and *H. chorizemifolia* (▲).

TYPIFICATION:

There are in De Candolle's herbarium in Geneva four specimens of *H. chorizemifolia*. The specimen bearing a label which reads 'aff. *chorizema*. Nouvell(e) Holland côte orient Mus de Paris 1491' pinned to the sheet is selected from among these specimens as the LECTOTYPE of *H. chorizemifolia*. De Candolle recorded that the species came from eastern Australia but this is an error.

Plagiolobium ilicifolium, described by Sweet in a footnote, was based on a specimen in A. B. Lambert's herbarium collected by Captain King at King Georges Sound. Unfortunately I have not succeeded in locating this specimen but it is clear that if the pod was described correctly as pubescent internally and externally it did not belong with the specimen. The alternative possibility that neither the specimen nor the pod is referrable to *H. chorizemifolia* is considered less likely as the leaf illustrated in t. 2 falls within the range of variation of this species. As it is considered that the leaf alone illustrated in t. 2 is inadequate for the purpose of serving as a lectotype, *Drummond 182* (MEL) is selected here as the NEOTYPE of *P. ilicifolium*. ISONEOTYPES are housed in BM, K, NSW and W.

It is clear from the protologue that *H. ilicifolia* Cunn. was recognized as a species distinct from *Plagiolobium ilicifolium* Sweet because it had glabrous pods in contrast to the pods of the latter species which had been described as pubescent. *H. ilicifolia* was based on a plant or plants raised by R. Mangles from seed from Swan River and on material collected by A. Cunningham at King Georges Sound. There is in Lindley's herbarium at CGE a sheet consisting of three twigs, two of which bear persistent calyces, an envelope containing the remnants of a pod and a mature and an immature seed, and a label just above the bottom right hand corner which reads '*Hovea ilicifolia* C. King Georges Sound. 1822'. Although the collector is not indicated, I am satisfied that this is one of the Cunningham specimens alluded to by Lindley. In Herbarium Benthamianum at K there is a sheet containing four different collections including some of Cunningham's. The flowering specimen second from the right, which is mounted with the apex at the foot of the sheet, has a label attached to its base with

'*Hovea ilicifolia* see *Plagiolobium*' written on it. The label at the foot of the sheet which covers the apex of the shoot indicates that the specimen was collected by Cunningham at King Georges Sound. These two collections are regarded as SYNTYPES of *H. ilicifolia*. I here select the fruiting specimen in CGE as the LECTOTYPE of *H. ilicifolia* Cunn..

NOTES:

The upper stamen-filament in *H. chorizemifolia* is usually free from the others, a feature which occurs only sporadically and irregularly in other species.

The leaves typically have distinctly sinuate pungent-pointed margins and a pungent apex and are very characteristic. However, leaf size and leaf shape, especially the shape of the margins, vary quite markedly and occasional specimens occur in which the margins are only slightly sinuate or undulate and possess only a few marginal teeth, for example, *J.H. Willis s.n.* (MEL 1532104). Some of these specimens (corresponding to var. *subintegrum* recognized by Meissner), which occur within the distributional range of both *H. chorizemifolia* and *H. elliptica*, have been confused in the past with *H. elliptica* or considered as intermediates between the two species but they are referrable to *H. chorizemifolia*. These specimens have the bract and bracteoles of *H. chorizemifolia* rather than those of *H. elliptica*, the upper stamen-filament is always free as in *H. chorizemifolia* and the lower surfaces of the leaves lack the distinctive asymmetrically biramate or medifixed hairs which are characteristic of *H. elliptica*. Even although the two species often grow together their habits are quite different. Leaf shape in *H. chorizemifolia* is clearly more variable than previously realized, but, despite this, there does not appear to be a means of dividing up the range of variation satisfactorily.

White-flowered variants occur occasionally, for example, *Mrs W.A. Ross* (PERTH) from Waroona.

3. **Hovea elliptica** (Sm.) DC., Prodr. 2: 115 (1825); Sweet, Hortus Britannicus 1: 111 (1826); Benth., Fl. Austral. 2: 175 (1864).

Poiretia elliptica Sm., Trans. Linn. Soc. Lond. 9: 305 (1808); *Phusicarpos elliptica* (Sm.) Poiret in Lamarck & Poiret, Encycl. meth. Bot. suppl. 4: 400 (1816). LECTOTYPE (here selected): Western Australia, King Georges Sound, 1803, Menzies (LINN, sheet 1190.2).

Platychilum celsianum Delaunay, Herb. Amat. t. 187 (1815); *Goodia simplicifolia* Spreng., Syst. Veg. ed. 16, 4(2): 267 (1827). LECTOTYPE (here selected): Delaunay, Herb. Amat. t. 187.

H. celsii Bonpl., Descr. Pl. Malmaison t. 51 (1816). LECTOTYPE (here selected): Descr. Pl. Malmaison t. 51.

Slender *shrub* or tree to 3 m high, often single-stemmed, young branches densely clothed with appressed to slightly spreading hairs, the hairs predominantly or exclusively medifixed or asymmetrically biramate, often rust-coloured. *Leaves*: lamina almost flat, elliptic, ovate-elliptic, obovate-elliptic to obovate or fusiform, (1·5–)2·5–10(–14) cm long, (0·5–)1–3·2(–6) cm wide, obtuse, emarginate, retuse or mucronate apically, glabrous above and reticulate, the venation usually prominent, lower surface and midrib sparingly to densely clothed with predominantly or exclusively medifixed or asymmetrically biramate hairs; petiole 0·8–1 cm long, sparingly to densely clothed with medifixed or asymmetrically biramate hairs. *Stipules* narrow-triangular, up to 1 mm long and 0·5 mm wide, sparingly to densely clothed with medifixed or asymmetrically biramate hairs. *Inflorescence* axillary, sessile or a pedunculate raceme, sometimes auxotelic, 1–7 flowered. *Flowers* pedicellate, the pedicels 4–9 mm long, densely clothed with rusty appressed hairs; bracteoles 1–1·5 mm long, up to 0·5 mm wide, inserted at the base of the calyx and appressed to it or inserted up to 1 mm below the calyx and free from it, densely clothed with appressed rusty hairs; bract 1–1·5 mm long, up to 0·5 mm wide, inserted at base of pedicel and 5–8 mm below the bracteoles, densely clothed with rusty appressed hairs. *Calyx*

densely clothed with appressed hairs, the hairs either all short and rusty or sometimes with longer paler hairs interspersed: 2 upper lobes 5·1–6·4 mm long including the tube 1·8–2·9 mm long, 6–8·1 mm across, emarginate; the 3 lower lobes 1·3–2·5 mm long. *Standard* 10·5–14·5 mm long, 11·5–17 mm wide, purplish-blue with a basal whitish horse-shoe shaped flare; wings 7·8–9·6 mm long, 3·5–5·5 mm wide, auricled, purplish-blue; keel petals 7·2–8·1 mm long, 2·6–3·2 mm wide, the inner margin sometimes papillate, purplish-blue. *Stamen-filaments* 5·5–6·2 mm long. *Ovary* 1·2–1·6 mm long, on a stipe 1–1·5 mm long, ovules 2 (rarely 3 or 4), glabrous; stigma papillate. *Pods* stipitate, the stipe about as long as the calyx, obliquely to transversely globular, ovoid or ellipsoid, 0·8–1·2 cm long, 0·8–1·3 cm wide, 0·7–1 cm thick, glabrous. *Seeds* elliptic, plump, 3·8–5·1 mm long, 2·8–3·1 mm wide, 2–2·7 mm thick, olive-brown or brown, the aril extending for more than half the length of the seed. (Fig. 1a–c).

Confined to the Menzies and Warren subdistricts of the Darling Botanical District and the western Eyre Botanical District of the Southwestern Botanical Province of Western Australia as defined by Beard (1980) occurring from the Preston River in the north to Cape Naturaliste and Cape Leeuwin in the west and south-eastwards to the Bremer River (Fig. 3). The label accompanying one specimen (MEL 666464) alleges that the specimen was collected by Maxwell in 1875 'near Cape Aird'. This is considerably further east than any other records of the species and suggests that the label may not belong with the specimen.

Recorded from laterite, gravel, granite outcrops, clay loam, stabilized sand dunes, sandy loam and sandy soils rich in organic matter. A common understorey plant, often with *Bossiaea laidlawiana* and *H. chorizemifolia*, in karri–jarrah–marri forests and woodland.

REPRESENTATIVE SPECIMENS (total number examined 222):

Western Australia — 5 km S. of Margaret River township on Caves Road, 28.x.1983, *M.G. Corrick 8959* (CBG, HO, MEL, NSW, PERTH). Davidson's Road, near corner of Coronation Road, W. of Manjimup, 10.x.1984, *M.G. Corrick 9238* (MEL). Willyung Hill, about 12 km N. of Albany, 23.ix.1984, *D.B.*

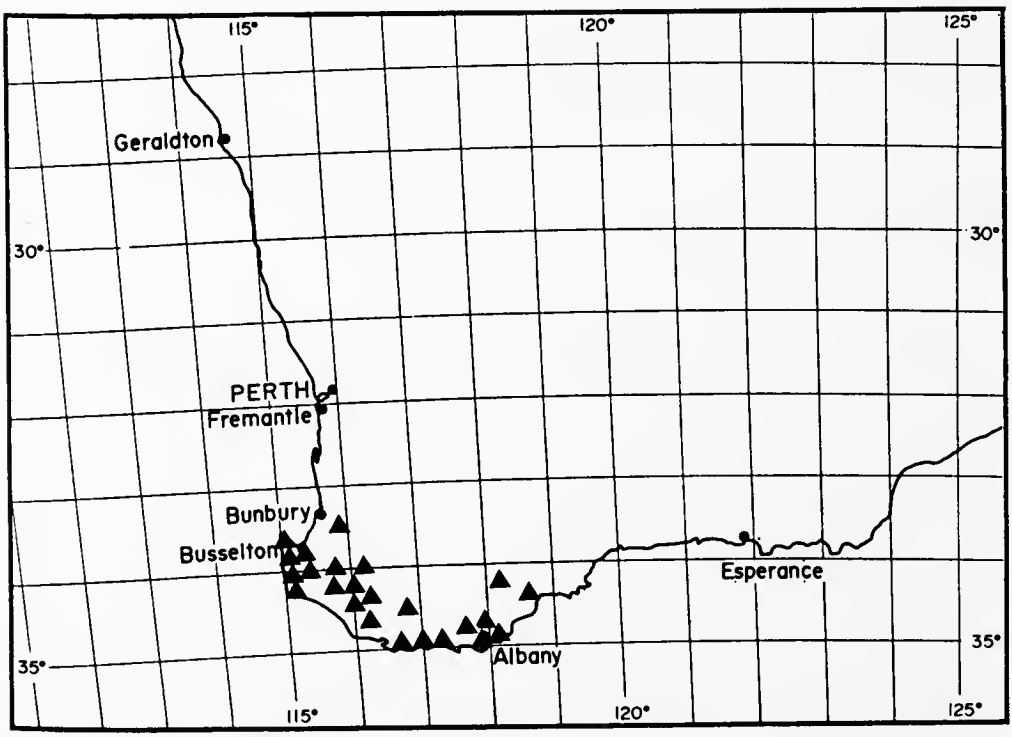

Fig. 3. The known distribution of *Hovea elliptica*.

Foreman 829 (AD, CBG, MEL, PERTH). Northern slope of Castle Rock, Porongurup Range, 29.ix.1966, *T.B. Muir 3966* (MEL). Bremer River, 1884, *W. Webb* (MEL 66439).

NOTES:

In stature *H. elliptica* is by far the largest of the Western Australian species. Some specimens of *H. trisperma* with large elliptic leaves are sometimes superficially similar to and have been confused with *H. elliptica*. Apart from differences in habit, *H. elliptica* invariably has 2 ovules per ovary in contrast to the specimens of *H. trisperma* which have 3–6 ovules per ovary, the indumentum on the lower surface of the leaves is different and the shape of the lamina itself is different.

Occasional white-flowered specimens of *H. elliptica* occur.

4. **Hovea trisperma** Benth. in Endl. *et al.*, Enum. Pl. Huegel 37 (1837); Meissn. in Lehm., Pl. Preiss. 1: 79 (1844); Benth., Fl. Austral. 2: 175 (1864); Wheeler, Fl. Perth Region 269 (1987). LECTOTYPE (here selected): Western Australia, King Georges Sound, *Huegel s.n.* (W).

H. lanceolata var. *linearis* Lindley in Edwards's Bot. Reg. 17: t. 1427 (1831). LECTOTYPE (here selected): Fragment from cultivated plant in Low's nursery, 1831, (CGE).

H. manglesii Lindley in Edwards's Bot. Reg. 24: t. 62 (1838). LECTOTYPE (here selected): Specimen from plant cultivated by *R. Mangles*, 1837, (CGE).

H. crispa Lindley in Edwards's Bot. Reg. 25: misc. 19 (1839). *H. trisperma* var. *crispa* (Lindley) Benth., Fl. Austral. 2: 176 (1864). LECTOTYPE (here selected): Specimen from plant cultivated by *R. Mangles* (CGE).

H. grandiflora Drummond, Hooker's J. Bot. 2: 365 (1840). *H. trisperma* var. *grandiflora* (Drummond) Benth., Fl. Austral. 2: 176 (1864). LECTOTYPE (here selected): Western Australia, *Drummond* (K).

H. splendens Paxton, Paxton's Mag. Bot. 10: 70, plate facing p. 103 (1843). LECTOTYPE (here selected): Paxton's Mag. Bot. 10: plate facing p. 103.

H. elliptica sensu Meissn. in Lehm., Pl. Preiss. 1: 79 (1844) *non* (Sm.) DC.

Subshrub to 0·6 m high with one or several stems arising from the base, stems often weak and sprawling unless supported by surrounding vegetation, young branches sparingly to densely clothed with appressed medifixed or asymmetrically biramate antrorse or spreading hairs, the hairs sometimes crimped or twisted. *Leaves*: lamina ovate, obovate, elliptic, elliptic-oblong, lanceolate, linear-oblong or on basal leaves occasionally almost rotund, those on lower leaves often shaped differently to those on upper leaves, (0·8–)2–8(–13) cm long, (0·3–)0·7–3·6 cm wide, obtuse, acute or shortly mucronate apically, margins slightly to distinctly recurved, entire, crisped or almost crenulate, upper surface pubescent especially when young or glabrous, sometimes prominently reticulate, lower surface sparingly to densely clothed with appressed to spreading or asymmetrically biramate often crimped hairs; petiole 1–3 mm long. *Stipules* subulate, up to 2 mm long, pubescent, sometimes persisting. *Inflorescence* axillary, sessile or on short peduncles, 1–6-flowered. *Flowers* pedicellate, the pedicels 1–7 mm long, densely clothed with appressed to spreading hairs; bracteoles subulate, 1·5–3 mm long, inserted at the base of or up to 2 mm below the calyx, pubescent; bract subulate, up to 3 mm long, inserted at the base of the pedicel. *Calyx* densely clothed with appressed antrorse to slightly spreading hairs: 2 upper lobes 6·1–11·7 mm long including the tube 2–4·5 mm long, emarginate; the 3 lower lobes 1·4–2 mm long. *Standard* 10·8–20·2 mm long, 10·5–25 mm wide, purplish-blue with a basal white horseshoe shaped flare; wings 9–14·8 mm long, 3·1–8 mm wide, purplish-blue; keel 6–11·6 mm long, 2·3–4 mm wide. *Stamen-filaments* 5–8 mm long, staminal sheath open on upper side and sometimes also on lower, occasionally the upper filament free. *Ovary* subsessile or on a stipe up to 2 mm long, 2–7-ovulate, glabrous. *Pods* shortly stipitate, the stipe about half as long to as long as the calyx-tube, globular, ovoid or ellipsoid, sometimes transversely so, 0·8–1·2 cm long, 0·8–1·2 cm wide, 0·65–1 cm thick, glabrous. *Seeds* elliptic, 4–6 mm long, 2·6–3·8 mm wide, 2–2·7 mm thick, uniform olive- to dark brown, aril collar-like with a raised upper lip, about $\frac{1}{2}$ to $\frac{2}{3}$ as long as the seed, margin sometimes slightly frilled.

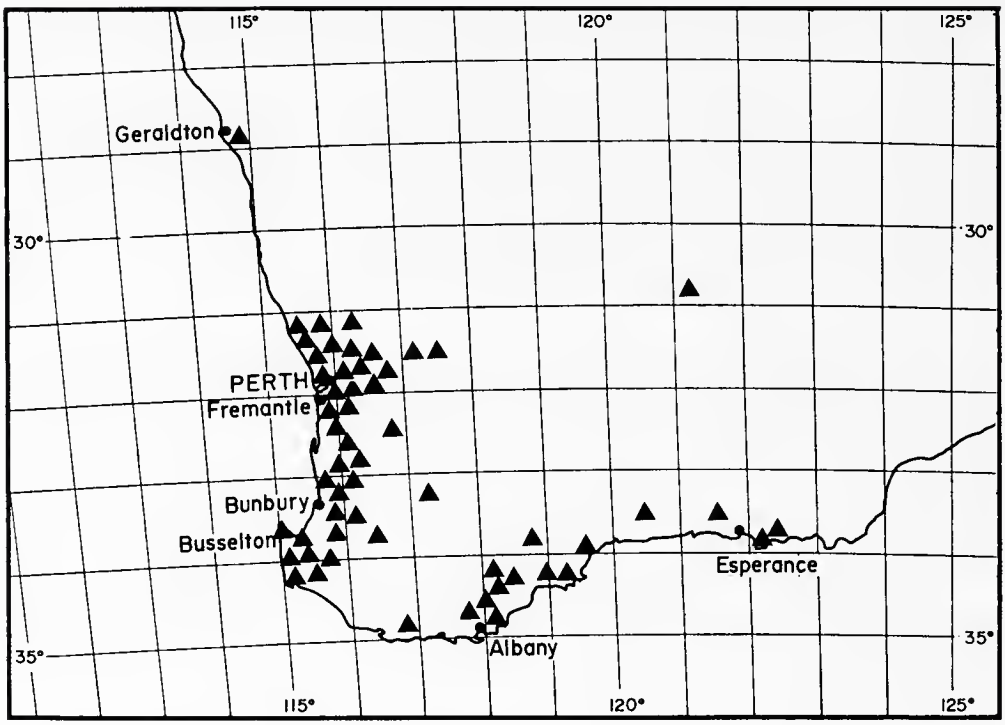

Fig. 4. The known distribution of *Hovea trisperma*.

Confined to the Irwin, Avon, Darling and Eyre Botanical Districts of the South-western Botanical Province of Western Australia as defined by Beard (1980) occurring from Mogumber in the north southwards to Augusta and eastwards with several large disjunctions to Duke of Orleans Bay east of Esperance. There are three early records from two localities far removed from the general range of distribution and confirmation of the existence of the species at these disjunct localities is required. The labels accompanying two specimens (NSW 58717, NSW 58737) indicate that they were collected by L. C. Webster in 1899 and 1900 respectively at Coolgardie, and the label accompanying a third specimen indicates that it was collected by F. Stoward (PERTH) at Geraldton in Sept. 1917. These localities are respectively much further west and north than those of any other records (Fig. 4).

Recorded from sandy soil in heath, tall *Banksia*, *Xanthorrhoea* or *Casuarina* – marri woodland, and in laterite, gravel and clay loam in *Eucalyptus* woodland or mallee. Occasionally found in wet low-lying areas in association with *Melaleuca*. Often growing in association with *H. chorizemifolia* in areas where the distribution of the two species overlaps.

Representative Specimens (total number examined 325):

Western Australia — Logue Brook Dam, hillside above Clarke Brook, 9.x.1984, *M.G. Corrick 9212* (MEL 669610); near Brookton Highway, ca. 11 km E. of Kelmscott, 10.x.1985, *M.G. Corrick 9635* (MEL 677476); near Gingin, 17.vii.1920, *C.A. Gardner 574* (MEL 1529399, PERTH); Wharton Beach, Duke of Orleans Bay, 30.ix.1985, *C.W. Huggins s.n.* (MEL 1540176); Bayswater, 22.vi.1907, *A. Morrison* (PERTH).

Typification:

The Lectotype of *H. trisperma* Benth. as here selected consists of two shoots, the left hand one in flower and the right hand one with young pods, mounted on a sheet in W bearing a label in the lower right hand corner which reads '111 *Hovea trisperma* King George's Sound Hügel'. The dehisced pods in an envelope bearing the number

401 mounted on the top left hand corner of the sheet do not belong with the mounted specimens on this sheet and are excluded from *H. trisperma.*

Lindley based his description of *H. lanceolata* var. *linearis* on a plant in cultivation in the nursery of Messrs Low and Co. of Clapton in March 1831. Fortunately a small fragment of the plant from Low's nursery is preserved in Lindley's herbarium at CGE and it is selected here as the lectotype of *H. lanceolata* var. *linearis.* The fragment is mounted in the lower right hand corner of the sheet, the remainder of the sheet being occupied by a specimen collected at the Vasse River by Mrs G. Molloy in 1839.

The description of *H. manglesii* Lindley was based on a specimen cultivated by Robert Mangles of Sunning Hill in Jan. 1837 and on specimens collected in Western Australia subsequently (possibly by Mrs G. Molloy) and communicated to his brother, Capt. James Mangles. The specimen cultivated by Robert Mangles in 1837 and a wild specimen from Western Australia, together with one collected by Drummond in 1839, are mounted on a sheet in Lindley's herbarium in CGE. Although Lindley mentioned having received wild specimens from Capt. Mangles I have only traced the one referred to. I here select the specimen cultivated by Robert Mangles in 1837 mounted in the lower right hand corner of the sheet as the LECTOTYPE of *H. manglesii.* As noted by Lindley, the leaves in this specimen are almost twice as wide as those on the specimen collected in the wild. Lindley commented that *H. manglesii* differed from *H. trisperma* in having a sessile ovary but the ovary illustrated in Edwards's Bot. Reg. 24: t. 62 is shortly stipitate.

Lindley based his description of *H. crispa* on a plant cultivated by Robert Mangles of Sunning Hill. A specimen preserved in Lindley's herbarium at CGE, mounted on a sheet to the right of a specimen collected by Drummond in 1839, is here selected as the LECTOTYPE of *H. crispa.* In the protologue Lindley described the ovary of *H. crispa* as 4-seeded. Although 3 or 4 ovules are recorded in *H. crispa* the ovaries are usually 2-ovulate and the ovary of a flower on the lectotype was found to have 2 ovules.

H. grandiflora Drummond was described from material collected between the Darling Range and Toodyay. The actual locality given was 'the west side of a hill, which the road crosses about a mile to the east of the watering-place called Goolgoil, by the natives . . .'. I have not succeeded in tracing this locality and efforts by Mrs R. Paynter of Toodyay and Mr and Mrs B. H. Smith of Manmanning have likewise been unsuccessful. There are in Herbarium Hookerianum at K two sheets of material bearing three different collections collected by Drummond which are referrable to *H. grandiflora.* All three collections are labelled Swan River, Drummond, and although none is named *H. grandiflora* at least two of the collections match the brief description and undoubtedly represent type material. I here select the collection to the right of the 'Herbarium Hookerianum' stamp on the right hand side of the sheet containing two different collections as the LECTOTYPE of *H. grandiflora.* The second collection on the sheet bears very much smaller leaves. The LECTOTYPE consists of two flowering branches, the one on the right mounted with the base at the top of the sheet and the apex at the foot. The shape of some of the leaves on the second sheet of Drummond material matches the description in the protologue better but the specimen is a poor one and consequently was not chosen as LECTOTYPE. Drummond specimens are housed in several other herbaria, for example BM, E, MEL and W, but there is no means of knowing whether or not they formed part of the type collection. Despite the absence of the name '*grandiflora*' on either of the sheets in K I am satisfied that Bentham would have been aware of Drummond's name and that Bentham's var. *grandiflora* was based upon *H. grandiflora* Drummond.

H. splendens Paxton was based on a plant cultivated by Mr Knight, Chelsea, from seed collected in Swan River Colony and sent to Capt. Mangles. I have not succeeded in locating a specimen upon which Paxton's plate was based and consequently now select the plate facing p. 103 in Paxton's Mag. Bot. 10 (1843) as the LECTOTYPE of *H. splendens.* I am not absolutely certain of the identity of *H. splendens* as I have seen no specimen that exactly matches the illustration or description but it is a probable synonym of *H. trisperma.* Bentham (1864, 2: 176) was of the opinion that it was 'very near' var. *crispa.*

NOTES:

H. trisperma is a variable species within which three main variants are evident and these correspond to the varieties *trisperma*, *crispa* and *grandiflora* recognized by Bentham (1864). Variety *crispa* was characterised by Bentham as having ovate to lanceolate often slightly cordate leaves with crisped or sometimes almost crenulate margins, more pubescent calyces and ovaries with 2–4 ovules whereas var. *grandiflora* was characterised by being nearly glabrous, having more coriaceous leaves with entire margins and strongly reticulate surfaces, large flowers and often 6 ovules per ovary. These differential tendencies enabled the material available to Bentham to be sorted readily into the three varieties but the abundant material now available and field observations indicate that each variant is far more variable than was apparent to Bentham and that the distinctions between them break down as the characters typifying each variant are not necessarily always associated together.

In their typical forms each variant is quite distinctive but specimens exhibiting a mixture of characters are difficult to place with certainty. For example, specimens which on the basis of flower size are referrable to var. *grandiflora* sometimes have as few as 4 ovules per ovary and linear-oblong leaves characteristic of typical var. *trisperma*. Conversely, specimens with 5 or 6 ovules per ovary and narrow-ovate or elliptic coriaceous leaves with prominent reticulate venation characteristic of var. *grandiflora* do not always have large flowers. Flowers in such specimens can be as small as those in other variants. Specimens with large flowers are not homogeneous in appearance because of the variation in the other characters. There is no discontinuity in flower size, pedicel length or in the number of ovules per ovary between the variants although there is a tendency for var. *crispa* to have 2 ovules per ovary (sometimes 3 or 4), var. *trisperma* to have 3 or 4 ovules (sometimes 2) and var. *grandiflora* 5 or 6 (sometimes 4 or 7). There is no significant difference in the flowering times of the variants. The main differential tendencies may be seen in Table 1.

Crispa appears to be less well differentiated than *grandiflora*. It is not uncommon in the Darling Range to find a range of variation within a population and plants with the characteristic spreading pubescence and crisped margins to the leaves (*crispa*) growing next to plants which lack the spreading pubescence and crisped margins to the

Table 1. The differential tendencies of the three main variants of *H. trisperma*

	Typical *trisperma*	Typical *crispa*	Typical *grandiflora*
Pubescence of branchlets	Hairs mostly appressed and antrorse but sometimes spreading, often crimped	Hairs spreading, usually almost at right angles to branchlet, sometimes crimped	Hairs mostly appressed and antrorse, sometimes crimped, at times glabrescent
Shape of leaf lamina	Linear-oblong, narrow-ovate, ovate or elliptic	Ovate, elliptic, elliptic-oblong, narrow-ovate or almost rotund	Ovate, narrow-ovate, obovate, elliptic, elliptic-oblong, linear-oblong
Leaf margin	Entire	Crisped to almost crenulate	Entire, occasionally almost crenulate
Pubescence of lower surface of leaf	Hairs more or less appressed or sometimes spreading, crimped	Hairs spreading, usually at right angles to the lamina	Hairs appressed or sometimes spreading, sometimes crimped, glabrescent
Pedicel length	1–4 mm	2–4·5 mm	2–7 mm
Length of 2 upper calyx lobes (including tube)	6·5–7·6 mm	6·6–8·1 mm	6·1–11·7 mm
Length of standard	11·5–13·8 mm	10·8–14·8 mm	12·8–20·2 mm
Length of wings	9–11 mm	9·2–12·4 mm	9·5–14·8 mm
Length of keel	6–8·1 mm	8–11·6 mm	6·9–10·3 mm
Number of ovules per ovary	Usually 3 or 4, sometimes 2	Usually 2, sometimes 3 or 4	Usually 5 or 6, sometimes 4 or 7

leaves (*trisperma*). The degree of crisping of the leaf margin can vary quite markedly on a single plant.

To some extent the morphological variation in *H. trisperma* is associated with geographical distribution. Typical var. *trisperma* is the most widespread of the variants occurring from near Gingin in the north as far inland as Kellerberrin southwards to Busselton and south-east to a little east of Esperance, var. *grandiflora* is recorded from Mogumber (with an outlier at Geraldton) southwards to Augusta with an outlier west of Ravensthorpe, and *crispa* occurs chiefly in the Darling Range north-east, east and south of Perth with outliers at Yanchep, Bindoon, Cunderdin, Northam, York and near Crossman. The distributional range of var. *crispa* falls entirely within that of var. *trisperma* and that of var. *grandiflora* overlaps that of var. *trisperma* except in the extreme north and south-west.

Although acknowledging the existence of these differential tendencies within *H. trisperma* the nature of the variation is such that I do not propose to recognize the variants formally. Names at varietal rank are available should anyone wish to use them.

Some specimens of *H. trisperma* with large elliptic leaves have been confused with *H. elliptica*. The two species differ in habit, in the nature of the indumentum on the lower surface of the leaves and *H. elliptica* invariably has 2 ovules per ovary whereas the specimens of *H. trisperma* which have been confused have 3–6 ovules per ovary.

Occasional specimens of *H. trisperma* with linear-oblong leaves are superficially similar to specimens of *H. linearis* from eastern Australia. The latter differs in the nature of the indumentum on the branchlets and lower surfaces of the leaves, in having smaller flowers and pubescent pods.

5. **Hovea pungens** Benth. in Endl. *et al.*, Enum. Pl. Huegel 37 (1837); Bot. Arch. 2: t. 7 (1837); Paxton, Paxton's Mag. Bot. 6: 101 (1839); Meissn. in Lehm., Pl. Preiss. 1: 78 (1844); Benth., Fl. Austral. 2: 176 (1864); Wheeler, Fl. Perth Region 269 (1987). LECTOTYPE (here selected): Western Australia, King Georges Sound, *Huegel s.n.* (W).

H. ulicina Meissn., Bot. Zeitung 13: 30 (1855). *H. pungens* var. *ulicina* (Meissn.) Benth., Fl. Austral. 2: 176 (1864). LECTOTYPE (here selected): Western Australia, Drummond, coll. 6 no. 26 (NY; ISOLECTOTYPE: CGE, MEL).

H. pungens var. *major* Paxton, Paxton's Mag. Bot. 10: 51 (1843). LECTOTYPE (here selected): Mag. Bot. 10: plate facing p. 51. A probable synonym.

Shrub or subshrub to 1·8 m high, single or several-stemmed, often much branched; branchlets densely clothed with a mixture of straight, curled, slightly crinkled or asymmetrically biramate appressed to slightly spreading or antrorse hairs. *Leaves* sessile or subsessile, typically inserted on the branch at an angle of more than 45° and often almost at right angles to it, the lamina arching outward or spreading laterally, often reflexed: petiole up to 0·5 mm long; lamina linear to narrowly elliptic-oblong or ovate-lanceolate, the margins strongly revolute and the lamina occasionally almost subterete, 0·5–3 cm long including the pungent tip, 0·1–0·3(–0·4) cm wide (excluding the inrolled margins), rigid, narrowed apically and terminating in a distinct pungent point, rounded or cordate basally, reticulate and glabrous above, lower surface with hairs usually confined to the midrib, some of the hairs usually asymmetrically biramate. *Stipules* setaceous, 2–5·5 mm long, often diverging, typically persisting for some time. *Inflorescence* axillary, sessile or on peduncles up to 1 mm long. *Flowers* solitary or in 2s or 3s, pedicellate, the pedicels 0·3–0·9 cm long, densely clothed with a mixture of short curled or asymmetrically biramate hairs and longer spreading hairs; bracteoles subulate, 1·5–3·5 mm long, inserted at the base of or a short distance below the base of the calyx, shorter than the calyx-tube, pubescent. *Calyx* densely clothed with short and longer appressed to slightly spreading antrorse hairs: 2 upper lobes 5·8–6·9 mm long including the tube 2–3·5 mm long, the 3 lower lobes 1·3–2·5 mm long. *Standard* 12–16·8 mm long, 12–16 mm wide, deeply emarginate apically (to 6 mm), purplish-blue with a basal

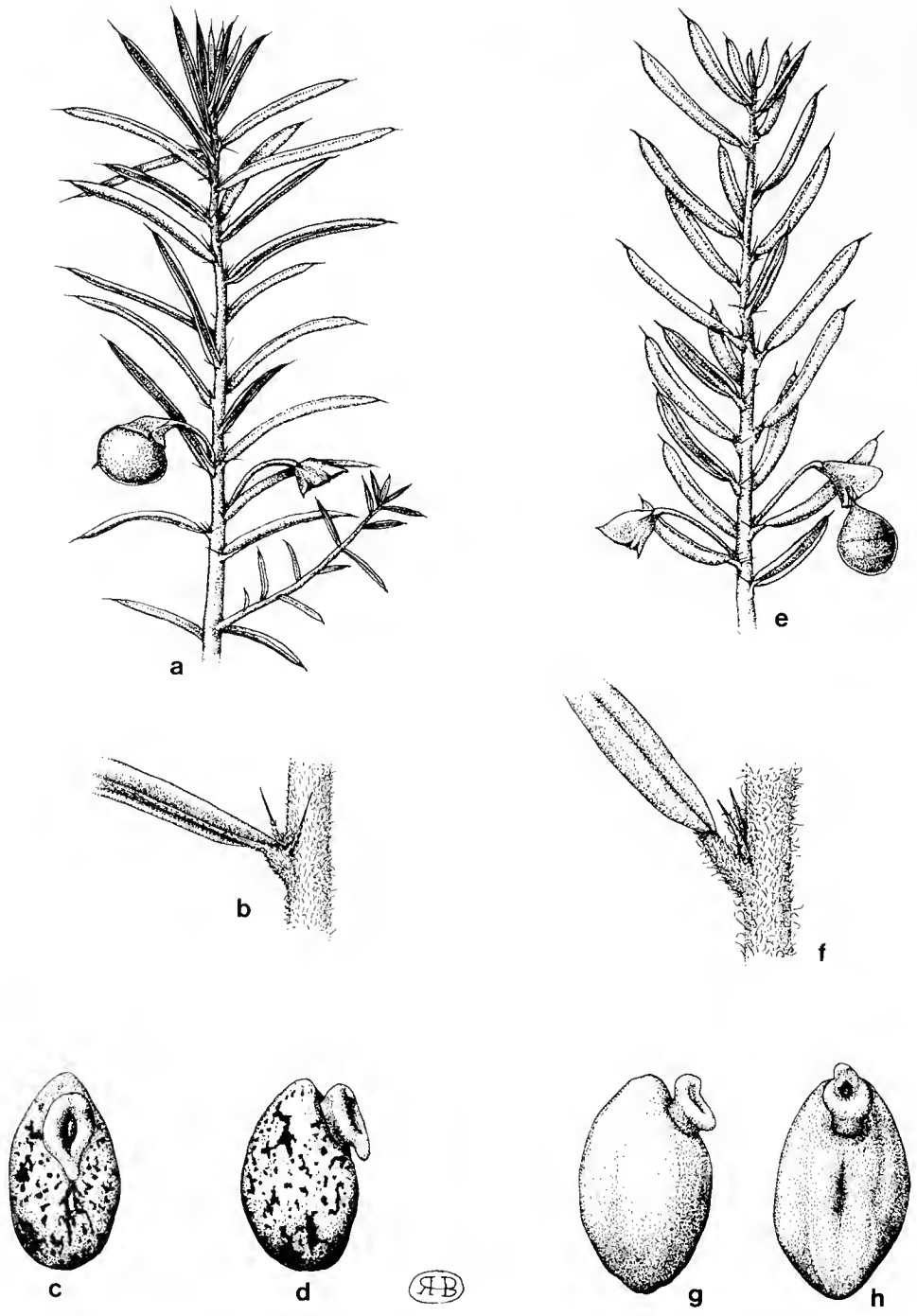

Fig. 5. *Hovea pungens*. a — fruiting twig, × 1. b — portion of stem showing point of attachment of a leaf, × 3. c — seed, hilar view, × 6. d — seed, side view, × 6. *H. stricta*. e — fruiting twig, × 1. f — portion of stem showing point of attachment of a leaf, × 3. g — seed, side view, × 6. h — seed, hilar view, × 6. a–d from *R. Pullen 9676* (MEL); e and f from *M.G. Corrick 9296* (MEL); g and h from *B.H. Smith 646B* (MEL).

white horse-shoe shaped flare; wings 9·8–12·5 mm long, 3·5–6·2 mm wide, purplish-blue; keel 4·2–6·7 mm long, 2–2·7 mm wide. *Stamen-filaments* 3·8–6·1 mm long. *Ovary* 1–1·3 mm long, on a stipe 0·4–1 mm long, 2-ovulate, glabrous. *Pods* shortly stipitate, the stipe not exceeding the calyx, obliquely to transversely globular, ovoid or ellipsoid, 0·6–0·9 cm long, 0·7–0·9 cm wide, glabrous. *Seeds* elliptic, plump, 4·1–5·5 mm long, 2–3·2 mm wide, 2–3 mm thick, dark brown or olive-brown with paler mottling, hilum elliptic, $\frac{1}{2}$ to $\frac{3}{5}$ as long as the seed, aril collar-like with a raised lateral lip, yellow. (Fig. 5 a–d).

Found in the Irwin Botanical District, the Drummond and Dale subdistricts of the Darling Botanical District, the extreme west (east of Toodyay) and south (Stirling Range) of the Avon Botanical District and the Eyre Botanical District of the Southwestern Botanical Province of Western Australia with an outlier at Coolgardie in the Coolgardie Botanical District of the Southwestern Interzone as defined by Beard (1980). Within the Southwestern Botanical Province the distribution of the species is interrupted by several disjunctions. It occurs in the northern sandplains and heaths from Burma Rd NW. of Mingenew in the north southwards to the Swan coastal plain and Darling scarp to the vicinity of Armadale and eastwards in the Wheatbelt to Wongamine. The species also occurs in the Stirling Ranges and eastwards in the Transitional Woodland with some further disjunctions to about 100 km E. of Esperance (Fig. 6). The three most northern occurrences of the species at Burma Rd, near Lake Indoon and Mt Lesueur are separated by some distance from the nearest populations near Mogumber and occur within the distributional range of the closely allied *H. stricta*.

Recorded from sandy soil and coastal limestone in low heath, shallow pockets of soil on and around granite outcrops, and from laterite, gravel, clay and loamy soils in heath, jarrah forest and woodland.

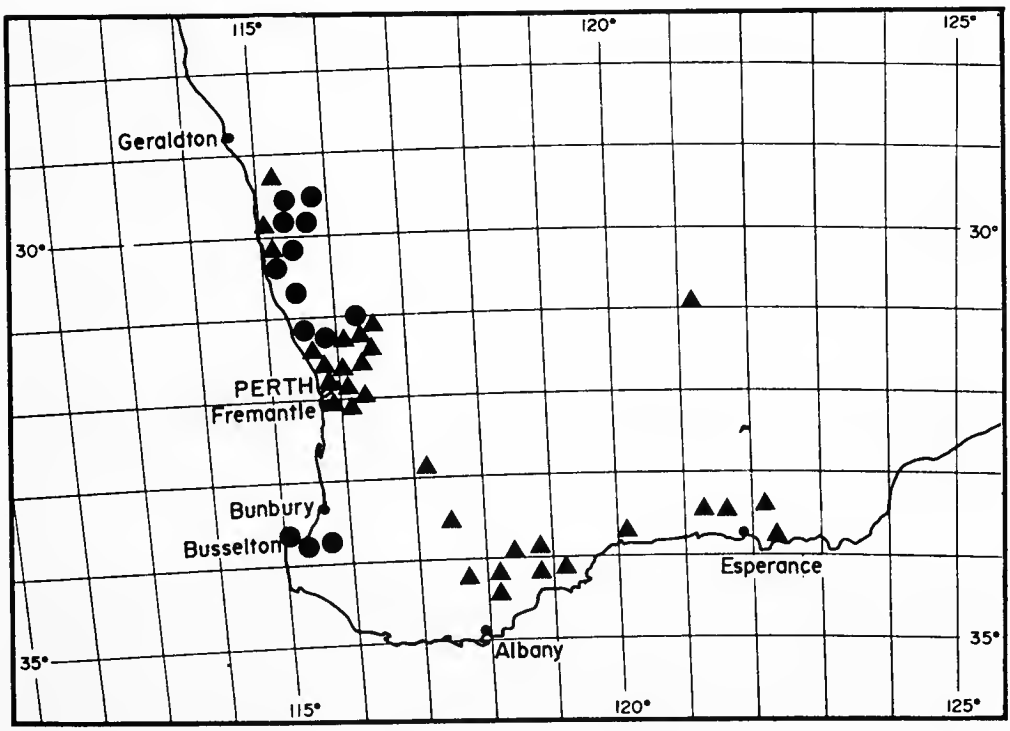

Fig. 6. The known distribution of *Hovea pungens* (▲) and *H. stricta* (●).

REPRESENTATIVE SPECIMENS (total number examined 157):

Western Australia — Coolgardie, 1902, *W.E. Blackall s.n.* (PERTH); 10 km due SSE. of Mt Burdett, 2.viii.1983, *M.A. Burgman 1637 & S. McNee* (PERTH); 1·5 km N. of Mt Lesueur, 20.vii.1979, *E.A. Griffin 1966* (PERTH); Foot of Bluff Knoll, Stirling Range, x.1984, *R. & M. Hamilton 32* (MEL, PERTH); Wongamine Reserve, 19 km NW. of Northam, 19.viii.1983, *B.H. Smith 243* (AD, CBG, HO, MEL, PERTH).

NOTES:

H. pungens is very closely allied to *H. stricta*. Bentham (1864) differentiated the two species on the basis of the shape of the leaf apices, those of *H. pungens* being described as 'pungent-pointed' in contrast to those of *H. stricta* which were described as 'obtuse with a small scarcely pungent point'. This may well have been true of the limited material available to Bentham but the material now available indicates that this character does not enable the two species to be differentiated.

The two species may be distinguished chiefly by the disposition of the leaves on the branches, the shape of the leaves and by the seeds. Very few seeds of *H. stricta* were available for study but as far as can be judged the seeds of the two species differ in colour, in the size of the hilum and the shape of the aril. The seeds of *H. stricta* are a uniform yellowish or olive-brown, the hilum is less than $\frac{1}{3}$ as long as the seed and the aril is shortly columnar whereas those of *H. pungens* are mottled, the hilum is about $\frac{1}{2}$ to $\frac{3}{5}$ the length of the seed and the aril is not as tall. It is unfortunate that seeds are seldom available as it restricts the use of seed as a distinguishing character. The almost invariable absence of seeds means that the two species are differentiated usually on vegetative characters. Despite this, most specimens can be sorted into two species quite readily as each has a different 'look' about it although the differences are difficult to express in words.

The leaves in *H. pungens* are sessile or on petioles up to 0·5 mm long and typically are inserted on the branch at an angle $>45°$ and often almost at right angles to it, the lamina arching outwards or spreading laterally and frequently slightly reflexed. In *H. stricta* the leaves are shortly but distinctly petiolate on petioles 0·75–1·5 mm long and typically are inserted on the branch at an acute angle ($<45°$), the lamina arching outwards and upwards with the apex pointing towards the apex of the branch. These differences in leaf shape are not absolute but the leaf lamina in *H. stricta* tends to be broader than in *H. pungens*. These apparently trivial characters do nevertheless enable most specimens to be sorted into the two species without much difficulty in the absence of seeds.

H. stricta tends to have a denser shaggier indumentum on many of its parts and the stipules are smaller and less persistent than in *H. pungens*. In addition, the growth form of the two species tends to differ, *H. stricta* often being smaller and more sparingly branched.

The application of the name *H. pungens* var. *major* Paxton, published a year before *H. stricta*, is not entirely certain. The plant illustrated is neither typical of *H. pungens* nor of *H. stricta* which is not surprising seeing that it was grown under glass. The diagnostic characters used to differentiate the two species are not readily evident from the illustration but it seems probable that the plant was referrable to *H. pungens* rather than to *H. stricta*. A cultivated specimen of *H. pungens* from South Australia shows an approach to the plant illustrated. Rather than treat *H. pungens* var. *major* as a name of uncertain application it is regarded here as a probable synonym of *H. pungens*.

6. **Hovea stricta** Meissn. in Lehm., Pl. Preiss. 1: 79 (1844); Benth., Fl. Austral. 2: 176 (1864). LECTOTYPE (here selected): Western Australia, 'in arenosis sylvae districtus Sussex', Dec. 1839, *Preiss 1057* (LD; ISOLECTOTYPE: MEL, NY).

H. stricta var. *major* Meissn., Bot. Zeitung 13: 30 (1855). LECTOTYPE (here selected): Western Australia, *Drummond coll. 6 no. 27* (NY; ISOLECTOTYPE BM, CGE, K, MEL, NSW, W).

Shrub to 1 m high, single or several-stemmed, usually sparingly branched; branchlets densely clothed with a mixture of straight, curled, slightly crinkled or

twisted villous or asymmetrically biramate spreading to slightly antrorse hairs. *Leaves* shortly but distinctly petiolate, typically inserted on the branch at an acute angle (less than 45°), the lamina arching outward and upward with the apex pointing towards the apex of the branch but sometimes inserted almost at right angles to the branch and spreading laterally: petiole 0·75–1·5 mm long; lamina linear to narrowly elliptic-oblong or ovate-lanceolate, the margins strongly revolute, (0·5–)1·2–4·2 cm long including the pungent tip, 0·15–0·75 cm wide (excluding the inrolled margins), rigid, obtuse apically and scarcely mucronate or narrowed and with a distinct pungent point, rounded or cordate basally, reticulate and glabrous or with scattered hairs above, lower surface with scattered hairs throughout or hairs confined to the midrib or sometimes glabrous, some of the hairs usually asymmetrically biramate. *Stipules* setaceous, up to 2·5 mm long, sometimes not persisting. *Inflorescence* axillary, sessile or on peduncles up to 1·2 mm long. *Flowers* solitary or in 2s or 3s, pedicellate, the pedicels 0·4–1·1 cm long, densely clothed with a mixture of short curled or asymmetrically biramate hairs and longer spreading hairs; bracetoles subulate, 1·2–3 mm long, inserted at the base of or a short distance below the base of the calyx, shorter than the calyx-tube, pubescent. *Calyx* densely clothed with short hairs and longer straighter or crisped spreading antrorse hairs: 2 upper lobes 4·4–7·5 mm long including the tube 2·5–4 mm long, the 3 lower lobes 1·6–2·5 mm long. *Standard* 14·5–17 mm long, 11·8–17·3 mm wide, deeply emarginate apically (to 6·5 mm), purplish-blue with a basal white horseshoe shaped flare; wings 11·5–13·5 mm long, 5–6·9 mm wide, purplish-blue; keel 7–7·7 mm long, 2·4–2·9 mm wide. *Stamen-filaments* 4·2–6·2 mm long. *Ovary* 1·2–1·5 mm long, on a stipe ± 1 mm long, 2-ovulate, glabrous. *Pods* shortly stipitate, the stipe not exceeding the calyx, globular, ovoid or transversely ellipsoid, 0·9–1·1 cm long, 0·9–1 cm wide, glabrous. *Seeds* elliptic, plump, 4·4–5 mm long, 2·8–3 mm wide, 2·5–3 mm thick, uniform yellowish- or olive-brown, hilum oval or elliptic, less than $\frac{1}{3}$ the length of the seed, aril collar-like, shortly columnar, with a raised lateral lip, yellow (Fig. 5 e–h).

Confined to the Irwin Botanical District and the Drummond subdistrict of the Darling Botanical District of the Southwestern Botanical Province of Western Australia as defined by Beard (1980) where there are two disjunct centres of distribution: one in the northern sandplains and heaths from west of Three Springs in the north southwards to the Moore River National Park, and the other from the Busselton area and Cape Naturaliste (Fig. 6). With one exception, all of the specimens from the southern centre of distribution were collected last century and cannot be localised accurately so that the extent and range of the populations is not clear.

In the northern part of its range the species occurs usually on white sand or sand over laterite in low heath, scrub or shrubland. The ecological preferences of the southern populations are not known as none of the specimens is accompanied by ecological data.

REPRESENTATIVE SPECIMENS (total number examined 44):

Western Australia — 4·8 km SW. of Mt Lesueur, 24.vii.1969, *M.I.H. Brooker 1938* (PERTH); Coorow-Green Head Rd, 16 km E. of Rose Thompson Rd, 6.ix.1984, *D.B. Foreman 565* (MEL, PERTH); 48 km W. from Three Springs, 27.viii.1948, *C.A. Gardner 9137* (PERTH); 16 km S. of Regans Ford, 26.viii.1964, *K. Newby 1386* (PERTH); Vasse River, *Oldfield* (MEL 666572); 39 km NNE. of Jurien on Green Head-Jurien Rd, 28.xi.1974, *R. Pullen 9676* (CANB, MEL).

NOTES:

The arils of the seeds of *H. stricta* are somewhat atypical for the genus in being less than three times longer than broad. This raises questions about the placement of the species in *Hovea* or the usefulness of this character in diagnosing the genus. Admittedly this observation is based upon the seeds of only one specimen of *H. stricta* which highlights the paucity of fruiting specimens in herbaria, especially those with mature pods and seeds, in many genera of Fabaceae and other families, a fact lamented by Bentham (1864) when discussing *Acacia*. Fruiting specimens of *Hovea* are collected far less frequently than flowering specimens, probably because the fruits are generally

inconspicuous and the plants are overlooked in contrast to the bright flowers which attract attention. More mature seeds of *H. stricta* are required to confirm whether or not the arils are always as observed on the fruiting specimen referred to above. *H. stricta* is very closely allied to *H. pungens*, the seeds of which are typical of *Hovea*. In view of this, and in the absence of any other correlated differential character, it would appear inappropriate to consider excluding *H. stricta* from *Hovea* on the basis of its seeds being different.

For a discussion of the differences between *H. stricta* and *H. pungens* see the notes under the latter species.

ACKNOWLEDGEMENTS

I am most grateful to Mr N. S. Lander, Mr C. R. Dunlop and Dr G. P. Guymer for answering enquiries and for photographing type specimens while serving as Australian Botanical Liaison Officer at the Herbarium, Royal Botanic Gardens, Kew; to Miss H. M. Cohn, Librarian, National Herbarium of Victoria, for checking State Library records relating to the holdings of *Bull. Soc. Imp. Naturalistes Moscou*; to my colleagues Mrs M. G. Corrick, Dr D. B. Foreman, Mrs R. A. Kilgour and Dr P. S. Short and to Mr & Mrs B. H. Smith, Manmanning, Mr & Mrs R. Hamilton, Kalamunda, Mr & Mrs C. E. Woolcock, Portland, and Mr C. W. Huggins, Anglesea, for making special collections; to my colleague Mr R. H. Barley for preparing the black line drawings which accompany the text; to Ms J. Hurse for technical assistance; to Dr M. D. Crisp, Herbarium, Australian National Botanic Gardens, Canberra, for the loan of colour transparencies of type material of *Daviesia? acanthoclada* Turcz.; to the Directors/Curators of AD, BM, BRI, CGE, E, HBG, HO, K, LD, NSW, NY, PERTH, PR, PRC and W for the loan of specimens and/or for working facilities in their institutions; to Mrs J. Thomas for typing the manuscript; and for an Australian Biological Resources Study grant which greatly facilitated this project.

REFERENCES

Beard, J. S. (1980). A new phytogeographic map of Western Australia. *Western Australian Herb. Res. Notes* 3: 37–58.

Bentham, G. (1864). Leguminosae in *Flora Australiensis*, Vol. 2. (Lovell Reeve & Co: London.)

Manuscript received 8 March 1988

A REVISION OF *PODOTHECA* Cass. (ASTERACEAE: INULEAE: GNAPHALIINAE)

by

P. S. SHORT*

ABSTRACT

Short, P. S. A revision of *Podotheca* Cass. (Asteraceae: Inuleae: Gnaphaliinae). *Muelleria* 7(1): 39–56 (1989). The endemic Australian genus *Podotheca* Cass. is revised. Six species are recognized and three of them, *P. pritzelii* P. S. Short, *P. uniseta* P. S. Short and *P. wilsonii* P. S. Short are described as new. *P. fuscescens* (Turcz.) Benth. and *P. pollackii* (F. Muell.) Diels are excluded from the genus.

GENERIC HISTORY

CONSERVATION OF THE NAME PODOTHECA CASS

Labillardiére (1806) described and named for the first time the genus *Podosperma* Labill. He attributed a single species, *P. angustifolia* Labill., to the genus and based his description on material gathered in Western Australia. The previous year the name *Podospermum* DC. (1805) had been erected. Both names apply to different genera of the Compositae and with the similarity of the names confusion soon reigned. Lessing (1832) incorrectly spelt *Podospermum* DC. as '*Podosperma*' and this mistake was perpetuated by Kunth (1838) and Schultz (1834). Prior to the aforementioned mistake Cassini (1822) had erected the name *Podotheca* Cass., indicating that it was the equivalent of *Podosperma* Labill. No reason for the name change was given and the required new combination for the species was not made. Four years later Cassini (1826) suggested that the name *Phaenopoda* Cass. be adopted instead of *Podosperma* and *Podotheca*. Lessing (1832) adopted the name *Podotheca* and effected the combination *Podotheca angustifolia* (Labill.) Less.

Graham (1842) described *Podotheca gnaphalioides* Grah. and Steetz (1845) also adopted the name *Podotheca*. Bentham (1867) followed suit and in citing generic synonyms referred to *Lophoclinium* Endl. (1843), *Phaenopoda* Cass. and '*Podospermum* Labill.'.

Podosperma Labill., not *Podotheca* Cass., was subsequently used by many authors (e.g. Mueller 1882, 1889 — as '*Podospermum*'; Ewart 1931, Black 1957; Curtis 1963). Others (e.g. Hoffman 1894; Rodway 1903; Maiden & Betche 1916) retained *Podotheca*.

Because of the confusion that had occurred with both *Podospermum* DC. and *Podosperma* Labill. Eichler (1964) proposed that the name *Podotheca* be conserved against *Podosperma* Labill. [Submittance of this proposal was partly influenced by the recognition in Australia of species referable to *Podosperma* and *Podospermum*, the latter being represented by the weed *P. laciniatum* (L.) DC. It now seems that *Podospermum* is generally considered to be synonymous with *Scorzonera* L.] The Committee for Spermatophyta (1967) reported that in their opinion *Podosperma* Labill. should be regarded as illegitimate (Art. 75) due to the similarity to *Podospermum* DC., thus making the conservation of *Podotheca* unnecessary. However, it was also felt that, as Art. 75 and the examples cited within left the question of the legitimacy of *Podosperma* open to dispute, it was in the interests of nomenclatural stability to recommend conservation of *Podotheca* against *Podosperma*. The General Committee of Botanical Nomenclature (1968) approved the proposal.

*National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

GENERIC DELIMITATION

Prior to Bentham's (1867) account of *Podotheca* three species had been referred to the genus, i.e. *P. angustifolia*, *P. gnaphalioides* and *P. pygmaea* A. Gray (1851). Bentham transferred two further species, *Ixiolaena chrysantha* Steetz and *Helipterum fuscescens* Turcz., to *Podotheca*. He noted that 'the genus is limited to Australia, differing from *Helipterum* chiefly in the stipitate achenes, and generally in the involucre, which however is less foliaceous in *P. fuscescens* than in the other species' (Bentham 1867, p. 601). Mueller (1882) retained the name *Podosperma* in preference to *Podotheca* and described a further new species, *P. pollackii* F. Muell. In the same publication he suggested that *P. fuscescens*, because of the outer scarious bracts of the involucre, should again be returned to *Helipterum*. Diels (1904) effected the combination *Podotheca pollackii* (F. Muell.) Diels.

Despite Mueller's comment that *P. fuscescens* be referred to *Helipterum* the species is commonly retained in *Podotheca*. All species of *Podotheca* occur in Western Australia and Grieve & Blackall (1975) recognized six species, i.e. *P. angustifolia*, *P. chrysantha*, *P. fuscescens*, *P. gnaphalioides*, *P. pollackii* and *P. pygmaea*. In this revision *P. fuscescens* and *P. pollackii* are excluded from *Podotheca s. str.*, three further species (*P. pritzelii*, *P. uniseta* and *P. wilsonii*) are described as new, and *P. pygmaea* is reduced to synonymy under *P. angustifolia*.

Merxmüller *et al.* (1977) referred *Podotheca* to their 'group 16' or '*Schoenia* group' of the Gnaphaliinae *sensu amplo*. This group is characterized by the triangular hairy appendage of the style arms and includes some members of Australian *Helichrysum* Miller and *Helipterum* DC. plus genera such as *Millotia* Cass. and *Waitzia* Wendl. *Podotheca s. str.* is readily distinguished from other members of this group by the involucral bracts, which are arranged in several series with the outer ones leaf-like, the pappus of usually one, five or ten bristles and the long, bisexual florets of the large capitula. The fruit has a prominent stipe (Fig. 2a) but this feature is not exclusive to species of *Podotheca s. str.* Chromosome number determinations by Turner (1970) suggest a base number of $x = 13$ for the genus.

Podotheca fuscescens is excluded from *Podotheca s. str.* on a number of grounds. The involucral bracts are quite dissimilar to those of *Podotheca s. str.* The outer leaf-like bracts are few in number and the inner bracts have white, opaque tips which are absent in species of *Podotheca s. str.* Other differences occur in the style appendages, which are more or less truncate and long papillate, and the pappus of *c.* 12–14 plumose bristles. *P. fuscescens* has strong affinities with *Helipterum oppositifolium* S. Moore and *H. strictum* (Lindl.) Benth. (P. G. Wilson, *in litt.*, 1987).

Podotheca pollackii is readily distinguished from members of *Podotheca s. str.* by virtue of the spike-like arrangement of the capitula. As with *H. fuscescens* the involucral bracts of this species differ from those in *Podotheca s. str.* and the fruit are anatomically different. In *Podotheca s. str.* the vascular bundles of the pericarp are oblique to the cotyledons and the sclerenchymatous layer in the pericarp is mainly one cell wide. In *P. pollackii* the vascular bundles are in the plane of the adaxial surface of the cotyledons and the sclerenchymatous layer is 2–4 cells wide. Unlike members of *Podotheca s.str.* fresh specimens produce a fetid odour when the leaves are crushed and the anthers are black. The style and anther morphology suggest the retention of *P. pollackii* in the '*Schoenia* group'. Its strongest affinities are with *Helipterum battii* F. Muell., *H. charsleyae* F. Muell. and *H. spicatum* (Lindl.) Benth. (P. G. Wilson, *in litt.*, 1987).

MATERIALS AND METHODS

Descriptions of taxa were made from dried herbarium material and from specimens stored in 70% ethanol. Shapes were defined using the terms given by the Systematic Association Committee for Descriptive Terminology (1962).

Specimens were examined from the following herbaria: AD, BM, E, K, LD, MEL, PERTH, S and W.

Pollen:ovule ratios (P/Os) were obtained following the method previously outlined (Short 1981). In all but *P. chrysantha* P/Os were obtained on a population basis, the number of pollen grains being determined for at least 15 florets, with each floret sampled from different plants. Measurements pertaining to anther characteristics (see Short 1985, fig. 1) were also obtained on a population basis.

Fruit sections were obtained following the fixation of dry, mature fruit with 5% glutaraldehyde in Pipes buffer (O'Brien & McCully 1981) and the subsequent infiltration and embedding in L. R. White (London Resin Co.). Sections were stained in toluidine blue (pH 4·5).

TAXONOMY

Podotheca Cass., Dict. Sci. Nat. 23: 561 (1822), *nom. cons.*; Less., Syn. gen. Compos. 272 (1832); DC., Prod. 6: 159 (1838); Steetz in Lehm. Pl. Preiss. 1: 448 (1845); Benth., Fl. Austr. 3: 600 (1867) p.p., excluding *P. fuscescens*; Benth. in Benth. & Hook. f., Genera Pl. 2: 315 (1873) p.p.; Hoffman in Engler & Prantl., Naturl. Pflanzenfam. IV(5): 190 (1890); Eichler, Regnum Veg. 34: 62 (1964); Taxon 16: 229 (1967); Grieve & Blackall, W. Aust. Wildfls 824 (1975); Cooke in Jessup & Toelken, Fl. S. Aust. 3: 1573 (1986); Lander in Marchant *et al.*, Fl. Perth Region 699 (1987). — *Podosperma* Labill., Nov. Holl. Pl. Sp. 2: 35, t. 177 (1806); J. M. Black, Fl. S. Aust. 1st ed. 636 (1929), 2nd ed. 914 (1957); W. M. Curtis, Stud. Fl. Tas. 341 (1963); J. H. Willis, Handb. Pl. Vict. 2: 719 (1973). — *Phaenopoda* Cass., Dict. Sci. Nat. 42: 84 (1826), *nom. illeg.* TYPE: *Podotheca angustifolia* (Labill.) Less.

Lophoclinium Endl., Bot. Zeitung (Berlin) 1: 457 (1843), p.p. excluding *L. album.* LECTOTYPE: Not chosen, see note 2 under *P. angustifolia.*

Annual herbs. Major axes decumbent to erect, sometimes cottony, with flat, septate hairs and/or glandular hairs. Stem simple or forming major branches at basal and/or upper nodes. *Leaves* mainly alternate but the lowest pair(s) opposite, all leaves sessile, sometimes succulent, entire, leaf bases ± decurrent, all leaves with flat, septate, non-glandular hairs usually mixed with glandular hairs. *Capitula* homogamous, ovoid to lanceoloid or obovoid to very broadly obovoid or ± oblong. *Involucral bracts* 14–*c.* 60, multiseriate, the outermost leaf-like, the inner mainly hyaline. *Receptacle* flat or concave, glabrous, base of pedicels prominent. *Florets c.* 10–300 per capitulum, all tubular, bisexual, 5-merous; style appendix triangular, papillose; stamens 5, anthers tailed and each with a sterile, apical appendage. *Cypselas* homomorphic, obovoid, pubescent; pericarp with a layer of sclerenchyma which is usually one cell wide but sometimes two cells wide around the two vascular bundles, the bundle orientation medial or oblique; testa of 2 ± distinct layers, the outer with crystals, vascular bundles absent; endosperm one cell wide; carpopodium oblique; pedicel or stipe prominent. *Pappus* usually of 1, 5 or 10 bristles *c.* the length of the corolla tube, bristles barbellate to plumose, joined at the base.

Chromosome numbers: n = 13, 26.

DISTRIBUTION (Fig. 1):

All six species occur in Western Australia and five are endemic to that state. *P. angustifolia* extends across the southern part of the mainland and reaches islands in Bass Strait. Three species in Western Australia seem to only occur on the margins of salt lakes. Two, *P. pritzelii* and *P. uniseta*, are restricted to the Avon Lake system and the Monger Lake system respectively (Bettenay & Mulcahy 1972; Mulcahy & Bettenay 1972). (Lake Moore, as suggested in 1973 by Beard, is considered to belong to the Monger system.) In contrast *P. wilsonii* occurs in three different Drainage Divisions, the Murchison, South-West and Eucla Divisions (Mulcahy & Bettenay *l.c.*).

REPRODUCTIVE BIOLOGY, CYTOLOGY AND EVOLUTION:

The use of pollen:ovule ratios (P/Os) in the determination of plant breeding systems has been previously discussed (Short 1981). The values obtained for five of the six species of *Podotheca*, ranging from one to several thousand (Table 1), suggests that

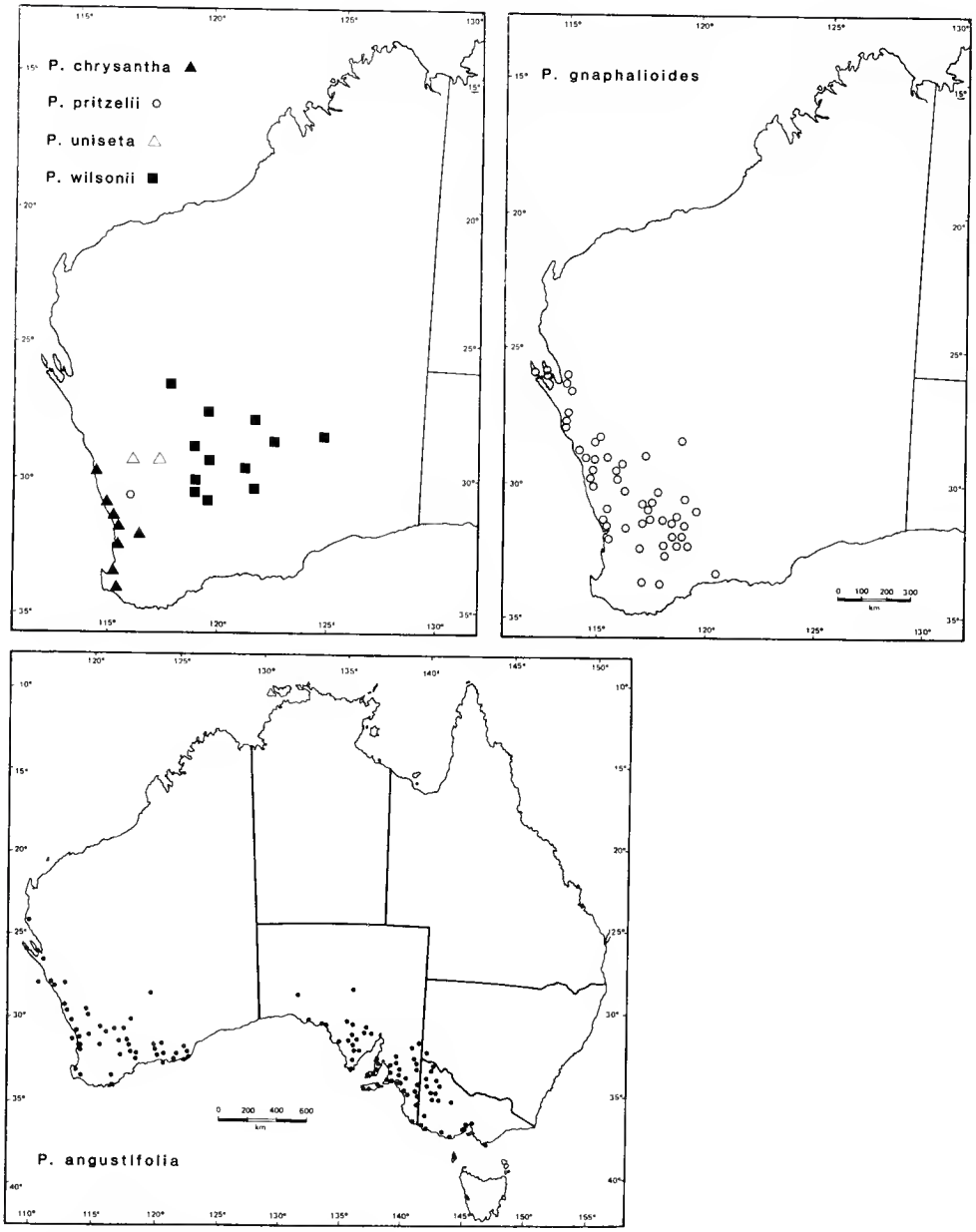

Fig. 1. Distribution of species of *Podotheca*.

they are outbreeders (i.e. cross-fertilization is common). In contrast *P. angustifolia*, with an average P/O of 184, is considered to be an inbreeder (i.e. self-fertilization is common). The low P/O in *P. angustifolia* is correlated with inconspicuous florets, compared to other species of *Podotheca*, and small anthers (Table 1).

Chromosome number determinations are only available for three of the six species (Table 1). All were recorded by Turner (1970) and suggest a base number of x = 13 for the genus. That polyploidy is recorded in *P. angustifolia* and no other species is not surprising when it is considered that it is the only one classed as an inbreeder.

Table 1. Pollen:ovule ratios (P/Os), anther characteristics, chromosome numbers and the number of pappus bristles in species of *Podotheca*. Minimum, maximum and averages values are shown where applicable.

Species	P/O	Total anther length (mm)	Length of microsporangia (mm)	Length of terminal anther appendage (mm)	No. of pappus bristles	Chromosome number (n)
P. angustifolia	98–270 (184)	0·65–1·15 (0·92)	0·33–0·82 (0·59)	0·23–0·46 (0·32)	5	13, 26
P. gnaphalioides	1654–3554 (2480)	1·24–2·61 (2·27)	1·37–2·14 (1·78)	0·37–0·66 (0·5)	5	13
P. pritzelii	1820–2024 (1872)	1·4–1·83 (1·59)	1·05–1·46 (1·22)	0·35–0·43 (0·38)	5	—
P. uniseta	1490–2896 (1891)	1·35–1·94 (1·59)	0·97–1·59 (1·24)	0·28–0·49 (0·35)	1	—
P. chrysantha	2320–3382 (2816)	1·74–2·24 (1·94)	1·24–1·77 (1·48)	0·39–0·52 (0·46)	(8)10(12)	13
P. wilsonii	1816–3678 (2863)	1·96–2·46 (2·14)	1·45–1·88 (1·6)	0·35–0·62 (0·54)	5	—

By virtue of the shape of the capitulum two groups can be discerned within *Podotheca*. Thus *P. chrysantha* and *P. wilsonii*, with obovoid to very broadly obovoid (rarely ± oblong) capitula, are readily distinguished from all other species which have ovoid or narrowly ovoid capitula. The dense vestiture of stalked, glandular hairs on the bracts also suggests that *P. chrysantha* and *P. wilsonii* are more closely related to one another than other species in the genus although such a vestiture does occur in a few specimens of *P. gnaphalioides*. The four remaining species are closely related, with three (*P. gnaphalioides*, *P. pritzelii* and *P. uniseta*) mainly differing in the number of pappus bristles, the presence or absence of succulent bracts and the distribution of septate hairs. Ecological differences also exist, with *P. uniseta* and *P. pritzelii* occurring in more saline habitats than *P. gnaphalioides*. (For further notes on morphological and ecological differences see under treatment of species.) *P. angustifolia*, although clearly having strong affinities with the proceeding three species, is readily distinguished by virtue of its inbreeding nature, correlated as it is with small florets and anthers. The widespread occurrence of *P. angustifolia* is consistent with the distribution observed for many other inbreeding species of the Inuleae (Short 1981).

On several previous occasions (Short 1981, 1986) attention has been drawn to the importance of the salt lake systems of south-west Western Australia to speciation in a number of inuloid genera. The apparent restriction of *P. pritzelii* and *P. uniseta* to separate lake systems further highlights their importance.

Key To Species of Podotheca

1. Pappus bristles 5 per floret
   2. Capitula obovoid to very broadly obovoid, rarely ± oblong; outer involucral bracts with stalked, glandular hairs not flat, septate hairs; pappus bristles usually white or pale yellow but sometimes the upper part pink ..... 2. *P. wilsonii*
   2. Capitula ovoid to narrowly ovoid; bracts glabrous or with flat, septate hairs, sometimes with stalked glandular hairs; pappus bristles white or pale yellow, never pink
      3. Florets inconspicuous, barely exerted above the bracts; anthers 0·4–1·15 mm long ..... 6. *P. angustifolia*
      3. Florets conspicuous, exerted well beyond the bracts; anthers 1·24–2·61 mm long
         4. Leaves and bracts at most semi-succulent, dark green or purple; glandular hairs usually present on major axes; outer involucral bracts usually with septate hairs, rarely glabrous ..... 3. *P. gnaphalioides*
         4. Leaves and bracts succulent, pale-green, rarely purplish; glandular hairs absent from major axes; outer involucral bracts glabrous . 4. *P. pritzelii*
1. Pappus bristles not 5 per floret
   5. Pappus bristles 1 per floret ..... 5. *P. uniseta*
   5. Pappus bristles (9)10(11) per floret ..... 1. *P. chrysantha*

1. **Podotheca chrysantha** (Steetz) Benth., Fl. Austr. 3: 602 (1867); Grieve & Blackall, W. Aust. Wildfls 824 (1975); Lander in Marchant *et al.*, Fl. Perth Region 700 (1987). — *Ixiolaena chrysantha* Steetz in Lehm., Pl. Preiss. 1: 459 (1845). — *Podosperma chrysantha* (Steetz) F. Muell., Fragm. 12: 22 (1882). Type: 'In arenosis sylvae prope oppidulum Perth, d. 23. Sept. 1839. Herb. Preiss. No. 105'. Lectotype (here chosen): *Preiss 105*, In Nova Hollandia (Swan River Colonia), in arenosis sylvae prope oppidulum Perth, s. dat. (MEL 1553907, ex herb. Steetz). Isolectotypes: GH, LD, MEL 1553905 (ex herb. Sonder), MEL 1553906 (ex herb. Sonder), MEL 1543871, P (three sheets, one ex herb. E. Drake, one ex herb. Schultz-Bip.), S, W (three sheets). (See note 1 below.)

Annual herbs. Major axes erect, 6–35 cm long, with stalked, glandular hairs, brown or brown purple. *Leaves* lanceolate or ± linear, 0·5–8·5 cm long, *c.* 0·1–0·65 cm wide, apex often incurved, with stalked, glandular hairs, green. *Capitula* obovoid to very broadly obovoid, 1–2·5 cm long, 0·4–3 cm diam. *Involucral bracts* 14–55 per

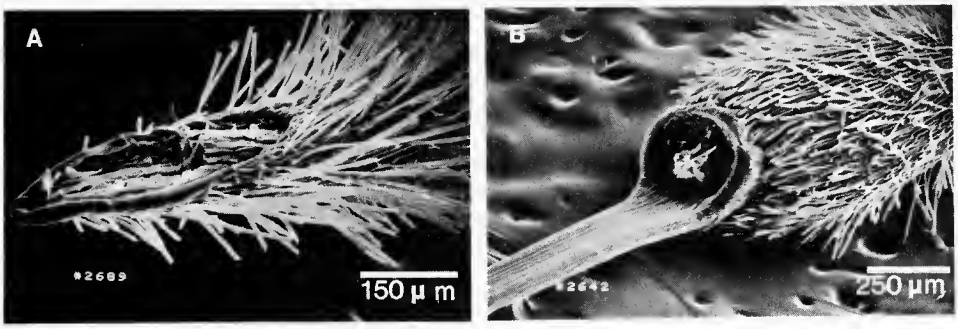

Fig. 2. a — Carpopodium of *P. angustifolia* (*Short 2689*). b — Apex of fruit of *P. uniseta* showing the single pappus bristle (*Short 2642*).

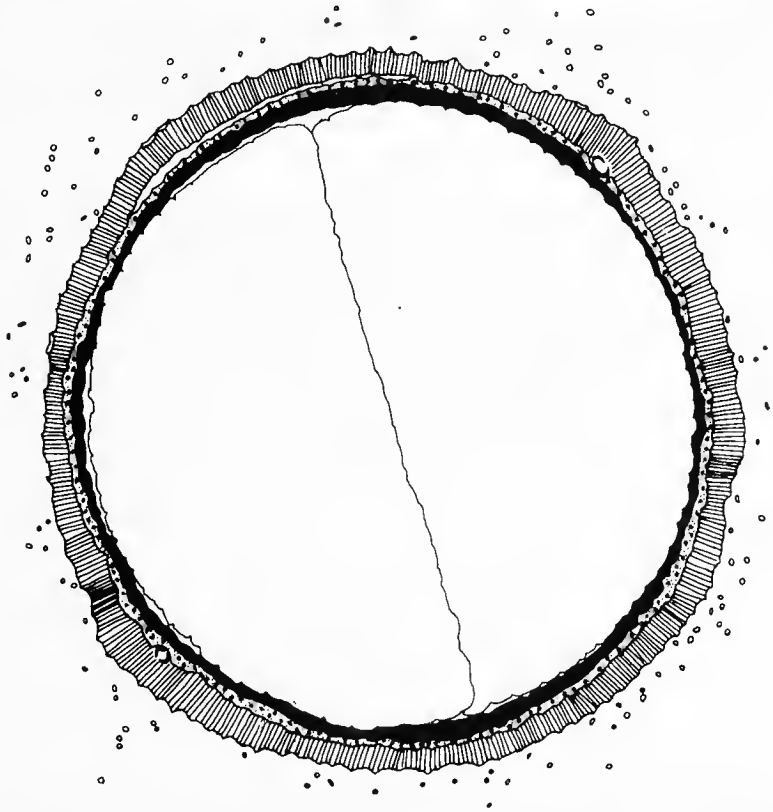

Fig. 3. Transverse section of fruit of *P. angustifolia* (*Short 2689*). Sclerenchyma = hatching, testa = dots, endosperm = black shading.

capitulum, narrowly elliptic, lanceolate, oblanceolate, narrowly obtrullate or narrowly to linear triangular, 6·5–14 mm long, 0·8–4·2 mm wide; outer bracts herbaceous, the surface with stalked, glandular hairs, sometimes with narrow hyaline margins with long-ciliate hairs; inner bracts hyaline except for an opaque midrib, glabrous or with long-ciliate hairs on the margins. *Florets* 10–320 per capitulum, yellow; corolla tube 7·5–12·5 mm long. *Stamens* 5; anthers 1·74–2·24 mm long; microsporangia 1·24–1·77 mm long; apical appendages 0·39–0·52 mm long. *Pollen grains c.* 500–600 per anther. *Cypselas* 2·3–3 mm long, 0·6–0·9 mm diam. *Pappus* bristles (9–)10(–11), smooth near the base, otherwise barbellate.

Chromosome number: n = 13 (Turner 1970).

DISTRIBUTION (Fig. 1):
Western Australia between latitudes *c.* 29° 30′ S. and 35° S. and west of longitude *c.* 117° E. A collection by Oldfield (K) is labelled as coming from the Murchison River but this seems to be erroneous.

ECOLOGY:
Favours sandy soil. Collectors' notes include 'low woodland . . . of *Banksia*, ridge of light yellow sand', '*Banksia* – coastal Blackbutt association' and 'closed heath, shallow sand over limestone on ridge'. Flowers from late August to December.

NOTES:
1. The selection of MEL 1553907 as the lectotype of *Ixiolaena chrysantha* is consistent with the argument previously put (Short & Sinkora 1988) that in the case of names originally coined by Steetz that specimens in his own herbarium should generally be chosen as lectotypes.

SELECTED SPECIMENS EXAMINED (Total *c.* 50):
Western Australia — near Boongarra, 17.x.1978, *Hnatiuk 780145* PERTH); Yanchep National Park, 17.x.1963, *James 19* (PERTH); 18 km E. of Lancelin, 17.x.1981, *Keighery 4140* (PERTH); Bayswater, 6.x.1897, *Morrison s.n.* (E, K, MEL 1543881, PERTH); Capel, 18.ix.1949, *Royce 3122* (PERTH).

2. **Podotheca wilsonii** P. S. Short, sp. nov.

Herba annua. Axes majores ascendentes vel erecti, 7·5–45 cm longi, pilis stipitatis glandulis. *Folia* linearia vel lanceolata, 0·5–13·5 cm longa, 0·1–1·1 cm lata, apicibus saepe incurvatis, pilis stipitatis glandulis, viridia usque purpurea. *Capitula* obovoidea usque perlate obovoidea, raro ± oblonga, 1·5–3·5 cm longa, 0·7–3 cm diametro. *Bracteae involucrales* 26–75, ovatae usque lanceolatae, oblanceolatae, anguste trullati usque trullati, triangulares vel ± lineares, 7·6–24 mm longae, 1–5·5 mm latae; bracteae exteriores herbaceae, pilis stipitatis glandulis, saepe marginibus angustis hyalinis pilis longis ciliatis ferentibus; bracteae interiores hyalinae praeter costa opaca, glabrae. *Flosculi* 44–294, lutei; corolla tubus 14·5–25·1 mm longa. *Stamina* 5; antherae 1·96–2·46 mm longae, unaquaeque pollinibus *c.* 400–660. *Cypselae* 1·7–2·1 mm longae, 0·55–0·65 mm diametro. *Pappi setae* 5, laeves usque barbellatae in parte inferna 1/3–1/2, in supera 1/2–2/3 subplumosae, plerumque albae vel luteolae sed interdum in supera 1/3 roseae.

HOLOTYPUS: Hammersley Lakes, *c.* 16 km S. of Mt Jackson Homestead, *c.* 30° 18′ S., 119° 01′ E. In sand amongst samphire, *Atriplex* and *Frankenia*. 7.x.1983, *Short 1995* (MEL 689073). ISOTYPI: AD, BRI, CANB, CBG, HO, K, NSW, NT, PERTH.

Annual herbs. Major axes ascending to erect, 7·5–45 cm long, with stalked glandular hairs, purple. *Leaves* linear or lanceolate, 0·5–13·5 cm long, 0·1–1·1 cm wide, the apex often incurved, with stalked glandular hairs, green to purple. *Capitula* obovoid to very broadly obovoid, rarely ± oblong, 1·5–3·5 cm long, 0·7–3 cm diam. *Involucral bracts* 26–75 per capitulum, ovate to lanceolate, oblanceolate, narrowly trullate to trullate, triangular or ± linear, 7·6–24 mm long, 1–5·5 mm wide; outer bracts herbaceous, the surface with stalked glandular hairs, often with narrow hyaline margins with long-ciliate hairs; inner bracts hyaline except for the opaque midrib, glabrous. *Florets* 44–294 per capitulum, yellow; corolla tube 14·5–25·1 mm long. *Stamens* 5; anthers 1·96–2·46 mm long; microsporangia 1·45–1·88 mm long; apical appendages 0·35–0·62 mm long. *Pollen grains c.* 400–660 per anther. *Cypselas* 1·7–2·1 mm long, 0·5–0·6 mm diam. *Pappus* of 5 bristles, bristles smooth to barbellate in the lower 1/3–1/2, the upper 1/2–2/3 subplumose, commonly white or pale yellow but sometimes the upper *c.* 1/3 pink. (Fig. 4)

DISTRIBUTION (Fig. 1):
Western Australia. Occurs between latitudes *c.* 25° 30′ S. and 31° 30′ S. and longitudes 118° E. and 124° 30′ E.

ECOLOGY:
Collectors' notes suggest that the species is restricted to saline, generally sandy soil. A single collection records that specimens were collected in a clay depression.

Fig. 4. Holotype sheet of *P. wilsonii* (*Short 1995*).

Notes include 'Growing in red-brown sand in open areas between shrubs of *Melaleuca*. On edge of salt lake' and 'In sand amongst samphire, *Atriplex* and *Frankenia*'.

NOTES:

1. The specific epithet honours Paul G. Wilson of PERTH.
2. Three of the thirteen collections examined contain plants in which the upper

part of the pappus bristles are pink. A single collection, *Demarz 4613*, has some specimens with pink bristles, others with yellow bristles.

3. *Podotheca wilsonii* has close affinities with *P. chrysantha* but the latter species has ten, rarely nine or eleven, bristles per floret, is always an erect herb and displays a preference for non-saline habitats.

SELECTED SPECIMENS SEEN (Total 13):

Western Australia — Lake Carey, 7.x.1973, *Demarz 4613* (PERTH); 41 miles N. of Bulga Downs, 24.ix.1975, *Demarz 5642* (PERTH); *c.* 16 km S. of Mt Jackson Homestead, 5.xi.1983, *Short 2298 & Haegi* (AD, MEL, PERTH); 30 km NE. of Nambi Homestead, 28.viii.1968, *Wilson 7482* (PERTH); southern margins of Lake Rason, 13.ix.1984, *Wilson 12117* (PERTH).

3. **Podotheca gnaphalioides** Grah., Bot. Mag. t. 3920 (1842); Steetz in Lehm. Pl. Preiss. 1: 449 (1845); Benth., Fl. Austr. 3: 601 (1867); Grieve & Blackall, W. Aust. Wildlfs 824 (1975); Lander in Marchant *et al.*, Fl. Perth Region 699 (1987). — *Podosperma gnaphalioides* (Grah.) F. Muell., Fragm. 12: 22 (1882). TYPE: 'raised at the nursery garden of Messrs. James Dickson & Sons, Edinburgh, in spring, 1841, from a collection of Swan River seeds, communicated the year before by Mr. Murray, Lintrose . . . struck from cuttings by Mr. Kelly . . . of Messrs. Dickson's establishment.' LECTOTYPE (here chosen): *Anon. s.n.*, Swan River, cult., s. dat. (K). (See note 1 below.)

Lophoclinium manglesii Endl., Bot. Zeitung (Berlin) 1: 457 (1843). TYPE: 'Nova Hollandia austro-occidentalis'. POSSIBLE SYNTYPES AND ISOSYNTYPES: *Preiss 107.* LD, MEL 1543867 (ex herb. Sond.), MEL 691442 (ex herb. Steetz), P, W. (See note 2 under *P. angustifolia.*)

Podotheca pygmaea A. Gray, Hook. J. Bot. Kew Gard. Misc. 4: 227 (1851). TYPE: 'Swan River, Drummond'. LECTOTYPE (here chosen): *Drummond 64*, Swan River, N. Holl., s. dat. (K). (See note 2 below.)

Annual herbs. Major axes ± prostrate to erect, 6–55 cm long, with flat, septate, non-glandular hairs and often stalked glandular hairs, green to purple. *Capitula* ovoid to lanceoloid, 2–5 cm long, 0·3–1·5 cm diam. *Involucral bracts* 27–43 (*c.* 60) per capitulum, ± ovate to lanceolate or narrowly to linear triangular or ± oblanceolate or narrowly obtrullate, 8·6–36·7 mm long, 0·9–3·8 mm wide; outer bracts herbaceous, sometimes semi-succulent, dark green or purple green, usually with narrow, hyaline margins with long-ciliate hairs, the outer surface with flat, septate hairs and/or stalked, glandular hairs, rarely glabrous; inner bracts hyaline except for an opaque midrib, glabrous or with long-ciliate hairs on the margins. *Florets* 10–204 per capitulum, yellow or yellow-orange, corolla tube 20·7–30 mm long. *Stamens* 5; anthers 1·24–2·61 mm long; microsporangia 1·37–2·14 mm long; apical appendages 0·37–0·66 mm long. *Pollen grains c.* 300–500 per anther. *Cypselas* 1·9–2·7 mm long, 0·5–0·75 mm diam. *Pappus* of 5 bristles, each bristle usually smooth at the base, grading to plumose, sometimes barbellate or ± plumose near the base.

Chromosome number: n = 13 (Turner 1970).

DISTRIBUTION (Fig. 1):

South-west of Western Australia, including Dirk Hartog Island.

ECOLOGY:

Occurs in a variety of habitats and tends to favour sandy soils but has also been found growing in clay loam. It apparently has some salinity tolerance, with plants having been gathered on the edge of saline depressions. However it is generally restricted to areas above the samphire zone. Collectors' notes include: 'Growing in sand with *Melaleuca*, occasionally just extending to area with *Gunniopsis* on edge of saline depression', 'closed heath, shallow sand over limestone', 'open forest *Eucalytpus wandoo*, clay loam in drainage line', 'Open heath, orange-brown sandy loam over outcropping ferrugineous sandstone', 'Sandplain with heath *c.* 2 m tall dominated by *Leptospermum* sp., *Casuarina cutivalvus* and *Acacia* spp.', 'In very

sandy loam on edge of granite outcrop' and 'mallee eucalypt – *Acacia* scrub, red-brown loam'.

NOTES:

1. It could be expected that type material examined by Graham is housed at E. However, a visit to E in August 1985 failed to reveal syntype material of *P. gnaphalioides*, there only being a photograph of the K specimen selected as the lectotype.

2. When describing *P. pygmaea* Gray referred to the 'whole plant scarcely above an inch high', suggesting that he had only seen a single specimen. The lectotype sheet contains two small plants. Despite this it seems that this is the material examined by Gray. The sheet is annotated with '*pygmaea n. sp.*' in his hand and no other possible type material has been located at GH (M. Canosa, *in litt.*, 1987) or any other herbarium.

3. *Podotheca gnaphalioides* is a polymorphic species in regard to its habit, which varies from prostrate to erect, and in the vestiture of the leaves and bracts. The most common form of the species has ascending to erect major axes and the outer involucral bracts have a vestiture of septate hairs and occasional, seemingly sessile or shortly stalked, glandular hairs (e.g. *Aplin 3362*, *Short 1602*, *Short 1722*). A few collections from drier and inland localities are of specimens with prostrate major axes and with bracts which are glabrous or with few septate hairs (e.g. *Blackall 453* from Sandstone). Other collections (e.g. *Willis s.n.* MEL 1555706, *Selk 1705*) are characterized by having bracts with a dense vestiture of stalked, glandular hairs as in *P. chrysantha* and *P. wilsonii*. Such specimens occur in the Jurien Bay–Yanchep region.

Formal recognition of the entities does not seem warranted but additional collections may prove otherwise.

SELECTED SPECIMENS EXAMINED (Total *c.* 120):

Western Australia — Dirk Hartog Island, 2.ix.1972, *George 11383* (PERTH); 15·5 km W. of Mullewa, 1.ix.1982, *Short 1602* (MEL, PERTH); Anderson Rocks, 13.ix.1982, *Short 1722* MEL, PERTH); Caroling Rocks, 6.x.1983, *Short 1971* (MEL); E. edge of Lake Moore, 15.ix.1986, *Short 2930* (AD, MEL, PERTH).

4. **Podotheca pritzelii** P. S. Short, sp. nov.

Herba annua. Axes majores ascendentes vel erecti, *c.* 5–25 cm longi, pilis planis septatis. *Folia* lineari vel lanceolata 1–3·5 cm longa, 0·1–0·25 cm lata, succulenta, pallens viridia vel purpurascentia, pilis planis septatis. *Capitula* ovoidea usque lanceoloidea vel cylindrica, 1·9–2·6 cm longa, 0·26–0·8 cm diametro. *Bracteaea involucralis* 15–32, ovatae usque lanceolatae vel anguste triangulares usque lineares triangulares vel obovatae usque oblanceolatae, 7·5–22 mm longae, 1·5–3·5 mm latae; bractae exteriores herbaceae, succulentae, pallentes virides vel purpurae, marginibus angustis hyalinis pilis longis ciliatis, pili septati absens; bracteae interiores hyalinae praeter costa opaca, glabrae. *Flosculi* 19–73; corolla tubes 14–19 mm longa. *Stamina* 5; antherae 1·4–1·83 mm longae, unaquaeque pollinibus *c.* 400. *Cypselae* 1·5–1·6 mm longae, 0·45–0·6 mm diametro. *Pappi setae* laeves usque barbellatae in parte inferna 1/3–1/2, superae 1/2–2/3 plumosae.

HOLOTYPUS: Lake Ninan, at junction of Brennan Road with the Wongan Hills–Yerecoin road. 30° 56′ S., 116° 39′ E. Growing in sand amongst samphire and *Melaleuca*. 25.x.1983, *Short 2214B* (MEL 1524328). ISOTYPI: AD, BRI, CANB, CBG, HO, K, NSW, PERTH.

Annual herbs. Major axes ascending to erect, 5–25 cm long, with flat, septate hairs. *Leaves* linear or lanceolate, 1–3·5 cm long, 0·1–0·25 cm wide, succulent, pale-green or purplish, with flat, septate hairs. *Capitula* ovoid to lanceoloid or cylindrical, 1·9–2·6 cm long, 0·26–0·8 cm diam. *Involucral bracts* 15–32 per capitulum, ovate to lanceolate or narrowly to linear triangular or obovate to oblanceolate, 7·5–22 mm long, 1·5–3·5 mm wide; outer bracts herbaceous, succulent, pale green or purple, with narrow hyaline margins with long-ciliate hairs, flat septate hairs absent; inner bracts hyaline except for opaque midrib, glabrous. *Florets* 19–73 per capitulum, yellow-orange; corolla tube 14–19 mm long. *Stamens* 5; anthers 1·4–1·83 mm long; microsporangia 1·05–1·46 mm long; apical appendages 0·35–

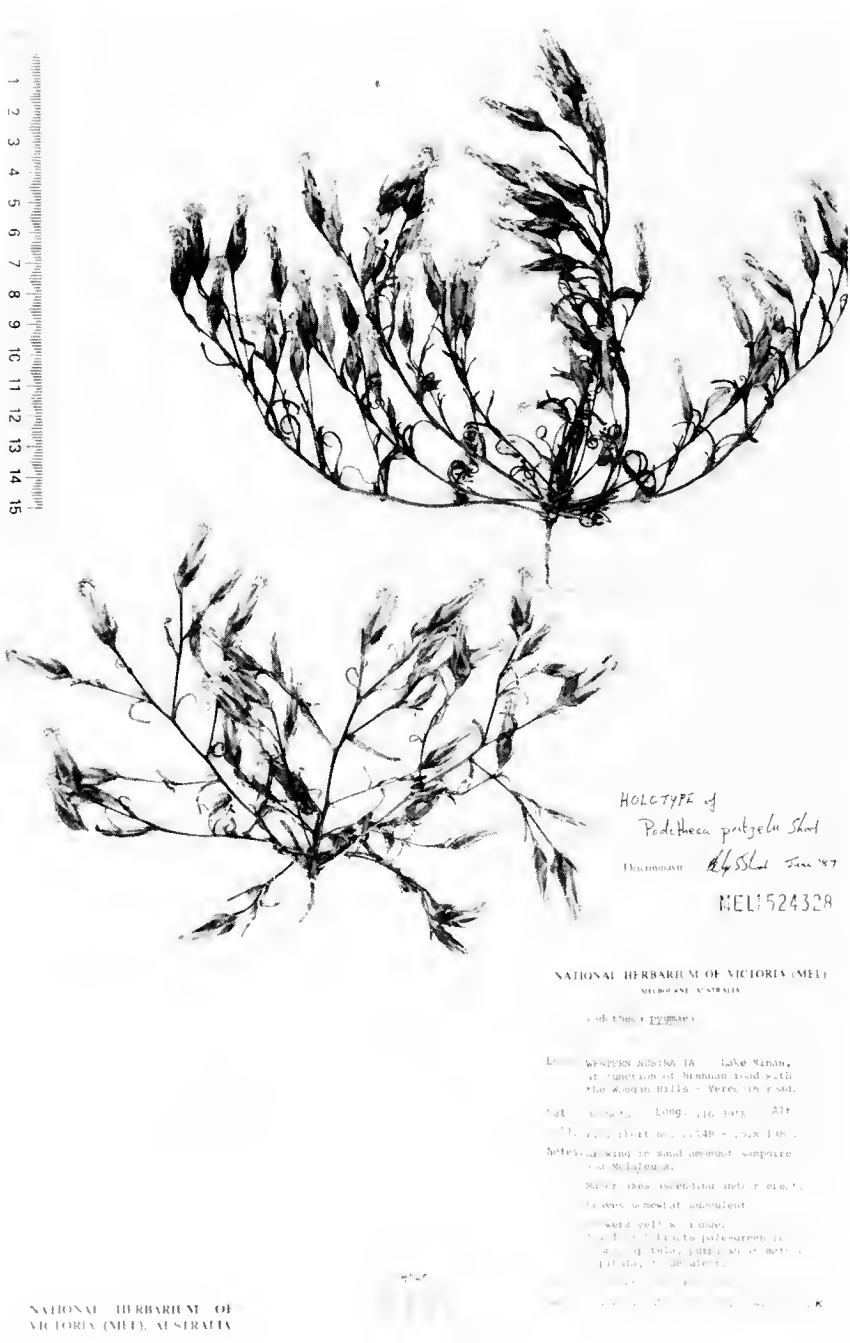

Fig. 5. Holotype sheet of *P. pritzelii* (*Short 2214B*).

0·43 mm long. *Pollen grains c.* 400 per anther. *Cypselas* 1·5–1·6 mm long, 0·45–0·6 mm diam. *Pappus* of 5 bristles, each smooth to barbellate in the lower 1/3–1/2, the upper 1/2–2/3 plumose. (Fig. 5).

DISTRIBUTION (Fig. 1):

Western Australia. Only known with certainty from the vicinity of Wongan Hills. A collection, *Gardner 7467*, said to come from Lake Annean, Nannine, seems to be

erroneously labelled. The locality seems more likely to be Lake Ninan, the type locality. A further collection, *Kenneally 5799* from the Mortlock Flora Reserve and containing somewhat immature specimens, may be of this species.

Lake Ninan is in the Monger Lake System (Bettenay & Mulcahy 1972).

ECOLOGY:

The only ecological data available comes from the type collection (see above) which indicates that the species grows in saline sand amongst samphire and *Melaleuca*.

NOTES:

1. The specific epithet commemorates Ernst Georg Pritzel, a German botanist who, in 1900–1901, collected with Ludwig Diels in Western Australia. The first collection of this species was gathered by Pritzel.

2. In the field *P. pritzelii* is readily distinguished from *P. gnaphalioides*. The leaves and bracts are manifestly succulent and are usually a distinct pale green, although sometimes the bracts may be purple. Larger individuals frequently branch at the upper nodes, an uncommon feature in *P. gnaphalioides*. There is also a tendency for the largest capitula in *P. pritzelii* to be smaller than those of robust specimens of *P. gnaphalioides*, a situation reflected by the bract and floret number per capitulum. The bracts of this species also lack flat, septate hairs on the outer surface, an uncommon condition in *P. gnaphalioides*.

Differentiation of *P. pritzelii* from *P. gnaphalioides* can be difficult from herbarium specimens, a situation not helped when habitat notes are lacking. Although the pale green colour of the leaves and bracts may more or less remain the original succulent nature is often not apparent in dried specimens.

Apart from morphological differences *P. pritzelii* is found in a different habitat from that frequented by *P. gnaphalioides*. The latter species was not observed at Lake Ninan when the type collection of *P. pritzelii* was gathered. As noted above *P. gnaphalioides* barely encroaches into the samphire dominated zone of saline lakes (also see under *P. uniseta*).

SPECIMENS EXAMINED:

Western Australia — ?Lake Annean, Nannine, x.1945, *Gardner 7467* (PERTH); Wongan Hills, 13.x.1903, *Morrison 13058* (K, PERTH — 2 sheets); District Avon, in apertis arenosis, x.1901, *Pritzel 775* (BM, E, K, PERTH).

5. **Podotheca uniseta** P. S. Short, sp. nov.

Herba annua. Axes majores ascendentes vel erecti, *c.* 5–25 cm longi, pilis planis septatis. *Folia* linearia vel lanceolata, 1–4·5 cm longa, 0·1–0·35 cm lata, succulenta. *Capitula* anguste ovoidea vel cylindrica, 2–2·8 cm longa, 0·26–0·9 cm diametro. *Bracteae involucralis* 23–35, ovatae usque lanceolatae vel anguste triangulares usque lineares triangulares vel lineares vel obovatae usque oblanceolatae, 4·5–22 mm longae, 0·6–3·2 mm latae; bracteae exteriores herbaceae interdum semisucculentae, marginibus angustis hyalinis pilis longis ciliatis, pili septati absens vel on bracteae eximae verticillus; bracteae interiores hyalinae praeter costa opaca, glabrae. *Flosculi* 26–67; corolla tubus 14·8–20·2 mm longa. *Stamina* 5; antherae 1·35–1·94 mm longae, unaquaeque pollinibus *c.* 300–600. *Cypselae* 1·8–1·9 mm longae, 0·55–0·65 mm diametro. *Pappus* annulus seta uno, seta laevi vel barbellata in parte inferna 1/2–2/3, in supera 1/3–1/2 plumosa.

HOLOTYPUS: E. edge of Lake Moore (*c.* 58 km from Paynes Find along Cleary road), 29° 40′ S., 117° 43′ E. Growing amongst *Gunniopsis* & *Halosarcia*. Sand. 15.ix.1986, *Short 2929* (MEL 689074). ISOTYPI: AD, BRI, CANB, HO, K, NSW, PERTH.

Annual herbs. Major axes ascending to erect, *c.* 5–25 cm long, with flat, septate hairs. *Leaves* ±linear or lanceolate, 1–4·5 cm long, 0·1–0·35 cm wide, succulent, green, red or purple. *Capitula* ±narrowly ovoid or ±cylindrical, 2–2·8 cm long, 0·26–0·9 cm diam. *Involucral bracts* 23–35 per capitulum, ovate to lanceolate or narrowly to linear triangular or ±linear or ±obovate to oblanceolate, 4·5–22 mm long, 0·6–3·2 mm wide; outer bracts herbaceous, sometimes semisucculent, green or tinged purple, with narrow, hyaline margins with long-ciliate hairs, septate hairs

absent or only present on bracts of the outermost whorl; inner bracts hyaline except for opaque midrib, glabrous. *Florets* 25–67 per capitulum, mainly yellow but upper part of corolla tube usually purple; corolla tube 14·8–20·2 mm long. *Stamens* 5; anthers 1·35–1·94 mm long; microsporangia 0·97–1·59 mm long; apical appendages 0·28–0·49 mm long. *Pollen grains c.* 300–600 per anther. *Cypselas* 1·8–1·9 mm long, 0·55–0·65 mm diam. *Pappus* a basal annulus with a single bristle, the bristle smooth or barbellate in the lower 1/2–2/3, the upper 1/3–1/2 plumose. (Figs. 1b, 6).

DISTRIBUTION (Fig. 1):

Western Australia. Only known from the margins of Lake Monger, Lake Moore and a saline flat south of Morawa. All locations fall within the Avon drainage system as defined by Beard (1973).

ECOLOGY:

Commonly found in the samphire zone surrounding salt lakes. Collectors' notes include 'Sandy rise in samphire flat with other chenopodiaceous shrubs and scattered *Eremophila*. Sandy to very sandy pale red loam forming weak crust in places; coarse sand frequently on surface' and 'Growing amongst samphire *c.* 20 m above salt pan, just extending into *Melaleuca* shrub zone. In white sand.'.

NOTES:

1. The single pappus bristle is the most distinctive feature separating this species from *P. gnaphalioides* and *P. pritzelii*. It is virtually indistinguishable from the latter on other features although the herbaceous bracts of *P. pritzelii* are more succulent and usually a bright green. The distinction of herbarium specimens of *P. gnaphalioides* from *P. uniseta* on morphological features other than the pappus seems untenable. However, distinct ecological differences have been observed where the two species occur in the same locality. At the type locality, where *P. uniseta* was observed to grow amongst samphire and *Gunniopsis*, *P. gnaphalioides* (*Short 2930*) was recorded as primarily growing under *Melaleuca*. Only occasionally did it extend to the outer limits of the samphire zone where individuals of both species grew. In the field it is evident that plants of *P. uniseta* tend to be smaller, have more succulent bracts and are coloured a deeper purple than specimens of *P. gnaphalioides*. Putative hybrid individuals have never been observed at such sites.

SPECIMENS EXAMINED:

Western Australia — 93·5 km N. of Cleary, 13.xi.1983, *Haegi 2642 & Short* (AD, MEL, PERTH); Mongers Lake, 3.ix.1982, *Short 1634B* (AD, CANB, HO, NSW, PERTH); Mongers Lake, 23.x.1983, *Short 2179B* (MEL); 5 km S. of Morowa, 16.ix.1986, *Short 2960* (MEL, PERTH).

6. **Podotheca angustifolia** (Labill.) Less., Syn. gen. Compos. 272 (1832); DC., Prod. 6: 159 (1838); Steetz in Lehm. Pl. Preiss. 1: 448 (1845); Benth., Fl. Austr. 3: 601 (1867); Grieve & Blackall, W. Aust. Wildfls 824 (1975); Cooke in Jessop & Toelken, Fl. S. Aust. 3: 1573 (1986); Lander in Marchant *et al.*, Fl. Perth Region 700 (1987). — *Podosperma angustifolia* Labill., Nov. Holl. Pl. Sp. 2: 35, t. 177 (1806); J. M. Black, Fl. S. Aust. 1st ed. 636 (1929), 2nd ed. 914 (1957); W. M. Curtis, Stud. Fl. Tas. 341 (1963); J. H. Willis, Handb. Pl. Vict. 2: 719 (1973). — *Phaenopoda angustifolia* (Labill.) Cass., Dict. Sci. Nat. 42: 84 (1826). TYPE: 'Habitat in terra Van-Leuwin.' SYNTYPES: FI (n.v.), P. (see note 1 below).

Lophoclinium citrinum Endl., Bot. Zeitung (Berlin) 1: 457 (1843). TYPE: 'Nova Hollandia austro-occidentalis'. POSSIBLE SYNTYPES & ISOSYNTYPES: *Preiss 106*, LD, MEL 1543637 (ex herb. Steetz), MEL 1543638 (ex herb. Sonder), MEL 691441, P (3 sheets), W (2 sheets). (See note 2 below.)

Annual herbs. Major axes ascending to erect, 2–30 cm long, sometimes cottony, always with some flat, septate, non-glandular hairs and short, usually conspicuously stalked, glandular hairs. *Leaves* ± linear, lanceolate or oblanceolate, 0·6–3(9) cm long, 0·1–0·3(0·7) cm wide, with flat, septate, non-glandular hairs and stalked glandular

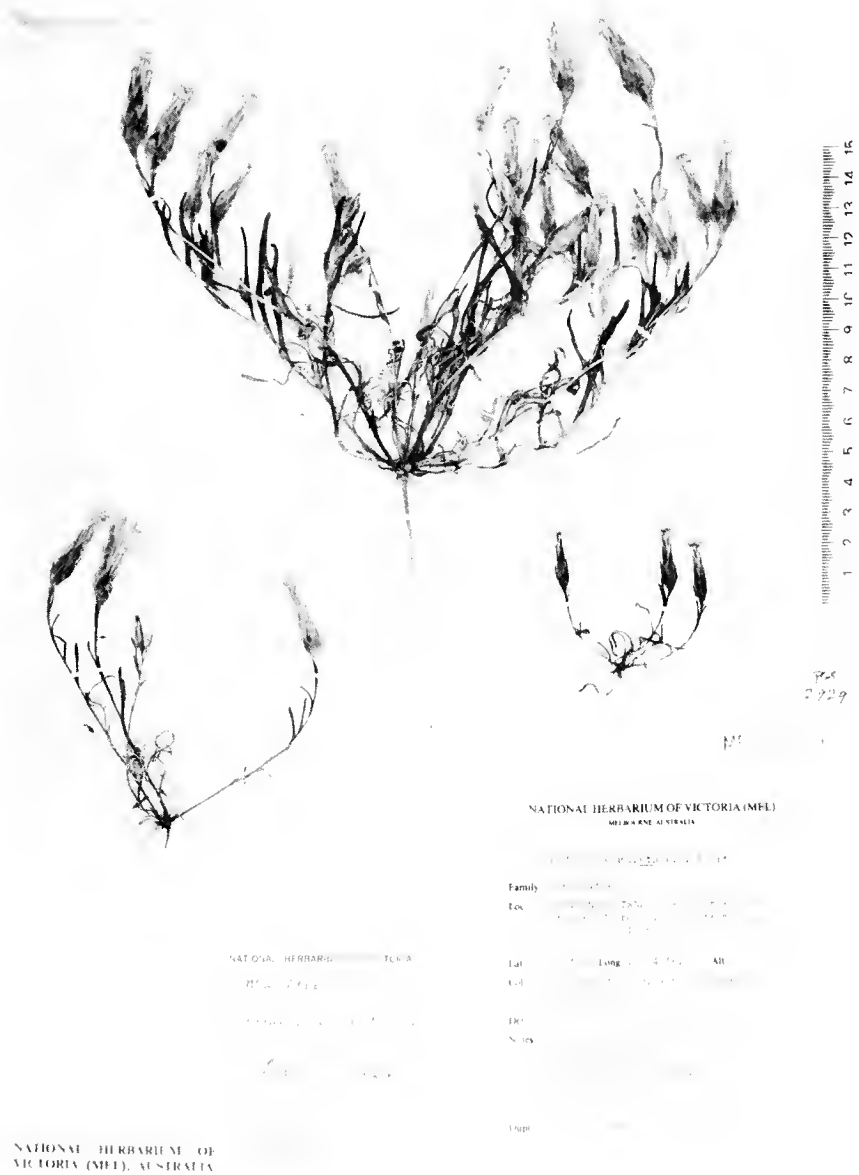

Fig. 6. Holotype sheet of *P. uniseta* (*Short 2929*).

nairs, sometimes ±succulent. *Capitula* ovoid to lanceoloid or ±cylindrical, 1·2–4·5 cm long, 0·3–1·2 cm diam. *Involucral bracts* 14–28 per capitulum, ovate to lanceolate or narrowly triangular to linear triangular or ±linear, 7–28 mm long, 1–3 mm wide; outer bracts herbaceous, sometimes ±succulent, green to purple, usually with narrow hyaline margins with long-ciliate hairs, the margins not extending to the usually recurved apex, the outer surface with flat, septate hairs and some glandular hairs; inner bracts hyaline except for an opaque midrib, glabrous or with long-ciliate hairs on the margin. *Florets* 9–73 per capitulum, usually yellow but the upper part of the corolla tube often purple; corolla tube 14–21 mm long. *Stamens* 5; anthers 0·65–1·15 mm long; microsporangia 0·33–0·82 mm long; apical appendages 0·23–0·46 mm long. *Pollen grains* 20–60 per anther. *Cypselas* 2·2–4 mm long,

0·4–0·7 mm diam. *Pappus* of 5 bristles, each bristle smooth at the base, grading to plumose in the upper 1/2–2/3.

Chromosome numbers: n = 13,26 (Turner 1970).

DISTRIBUTION (Fig. 1):

Western Australia (south of a line extending from Pt Quobba through Menzies to the south coast and including islands such as Rottnest Island and North Island and West Wallabi Island in Houtman Abrolhos), South Australia (S. of *c.* 30° S.), south-west New South Wales, Victoria and islands of Bass Strait.

ECOLOGY:

Occurs in an array of coastal and inland habitats. Collectors' notes include 'Open scrub . . . dominated by *Leucopogon parviflorum*, in swale near inland margin of dunes', 'in open *Melaleuca cuticularis* swamp . . . in low lying winter wet grey sandy clay with clay subsurface', 'Calcareous soils. *Agonis flexuosa* open woodland', 'on white sand ridge between trees of *Casuarina*', 'in sandy loam amongst *Melaleuca* trees immediately above saline depression and extending into open salmon gum woodland with an understorey of *Atriplex*, *Eremophila*, *Olearia* and *Acacia* shrubs. Sometimes growing with *P. gnaphalioides*', 'Open scrub . . . *Banksia – Acacia*, deep sandy silt', 'Moderately exposed base of small granite mountain. Variable-drained, shallow, arkosic loamy sand' and 'sand ridge with low mallee eucalypts and *Callitris*. Associated herbs include *Gnaphalium* sp. & *Waitzia acuminata*'.

NOTES:

1. Type material of *P. angustifolia* is presumably held at FI but is not available for loan. Both the description and illustration leave little doubt as to the application of the name. A single specimen in P is probably syntype material. It was at one time in the herbarium of E. Drake and is labelled in an unknown hand as having been collected by Labillardiére. It consists of a single capitulum and dissection of one of several poorly preserved florets revealed anthers barely 1·1 mm long. The original illustration shows a plant in which the capitula are somewhat open and in this respect the P specimen is also a good match.

A further specimen in P attributed to the D'Entrecasteaux expedition and said to be of *P. angustifolia* is considered to be erroneously labelled. It is not a match for Labillardiére's description or illustration and in fact is of *P. gnaphalioides*. The notion that the label is incorrect is supported by the fact that the D'Entrecasteaux expedition, of which Labillardiére was a member, explored the southern coastline of Western Australia. *P. gnaphalioides*, unlike *P. angustifolia*, barely encroaches upon the southern coast.

2. Endlicher (1843) described the genus *Lophoclinium* and included in it three species, i.e. *L. manglesii* Endl., *L. citrinum* Endl. in [sect.] *Lophoclinium* (as '*Eulophoclinium*') and *L. album* Endl. in [sect.] *Brachycallyma* Endl. (Endlicher did not indicate the rank of the infrageneric names.) It follows that *Lophoclinium* should be lectotypified by *L. manglesii* or *L. citrinum*, but due to uncertainty as to the typification of both names, neither has been chosen.

Endlicher, apart from indicating that the species were from 'Nova Hollandia austro-occidentalis', gave no information pertaining to the identity of the specimens and their collector(s). Bentham (1867) reduced *L. manglesii* to synonymy under *P. angustifolia* and *L. citrinum* was placed under *P. gnaphalioides*. He also suggested that *L. album* was conspecific with *P. fuscescens* but was clearly uncertain as to its identity. Specimens from W have been examined and it seems that both *L. manglesii* and *L. citrinum* were described from specimens gathered in Western Australia by Ludwig Preiss. Thus single specimens of both *Preiss 106* (of *P. angustifolia* and collected from Rottnest Island) and *Preiss 107* (of *P. gnaphalioides* and from Lake Mathilda) are labelled, in what I suspect is Enlicher's hand, as *L. citrinum* and *L. manglesii* respectively. The labels were compared with a sample of Endlicher's handwriting contained in a file compiled by Mr A. Court and housed at MEL. However, I have some doubts as to the handwriting on the *Preiss* collections. It is not too dissimilar to

that of Lehmann. Furthermore, if the Preiss collections are syntypes then the application of the names *L. citrinum* and *L. manglesii* differ from that applied not just be Bentham but, as evident from determinations on sheets in W, by other botanists. Because of such doubts I have refrained from selecting lectotypes of both names, merely suggesting that the Preiss collections are syntypes or isosyntypes.

The application of the name *Lophoclinium album* remains unresolved as no specimens bearing this name arrived with the loan of *Podotheca* from W. However, it is clear that this name does not apply to members of *Podotheca s. str.* as the plant was described as having a single row of involucral bracts and white florets, each with a pappus of about 15 bristles.

SELECTED SPECIMENS EXAMINED (Total *c.* 320)

Western Australia — 4·7 km E. of Yellowdine, 18.ix.1982, *Short 1752* (MEL); 16·5 km SW. of Nannup, 1.xi.1983, *Short 2268 & Haegi* (AD, MEL, PERTH).

South Australia — Danggali Conservation Park, 12.xi.1980, *Conn 910* (AD); W. of Lake Newland, 12.x.1967, *Donner 2448* (AD).

New South Wales — 5·5 km N. of Wentworth–Renmark Rd on road to Belmore, 10.ix.1980, *Christensen 54* (AD).

Victoria — King Island, xi.1887, *French s.n.* (MEL 1543649).

ACKNOWLEDGEMENTS

I thank Mr J. Nailon for the SEM photographs and Miss K. E. Wison for general technical assistance, including the preparation of the fruit sections and illustrations. Mr P. G. Wilson kindly provided comments on the affinities of *P. fuscescens* and *P. pollackii* and Dr W. R. Barker assisted with the Latin descriptions.

This paper is partly the result of a broad survey of fruit anatomy of species of Australian Gnaphaliinae, a survey funded by Australian Biological Resource Study grants (1982–1987).

REFERENCES

Beard, J. S. (1973). 'The elucidation of palaeodrainage patterns in Western Australia through vegetation mapping'. Vegetation Survey of Western Australia, Occasional Paper 1. (Vegmap Publications: Perth.)

Bentham, G. (1867). 'Flora Australiensis', vol. 3. (Reeve: London). *Podotheca*, pp. 600–602.

Bettenay, E. & Mulcahy, M. J. (1972). Soil and landscape studies in Western Australia. (2) Valley form and surface features of the South-West Drainage Division. *J. Geol. Soc. Aust.* 18: 349–357.

Black, J. M. (1957). 'Flora of South Australia', pt 4, ed. 2. (Govt. Printer: Adelaide.) *Podosperma*, p. 1127.

Cassini, H. (1822). *Podotheca. Dictionnaire des sciences naturelles* 23: 561.

Cassini, H. (1826). *Phaenopoda. Dictionnaire des sciences naturelles* 42: 84.

Committee for Spermatophyta (1967). Conservation of generic names, VII. *Taxon* 16: 226–229.

Curtis, W. M. (1963). 'The Student's Flora of Tasmania', pt 4, ed. 2. (Govt. Printer: Tasmania.) *Podosperma*, p. 341.

Diels, L. (1904–1905). Fragmenta phytographiae Australiae occidentalis. *Bot. Jab.* 35: 55–662. [*Podotheca pollackii* p. 617, (1804)].

Eichler, H. (1964). Proposal for the conservation of 9009 *Podotheca* Cass. (1822) versus *Podosperma* Labill. (1806). *Regnum Veg.* 34: 62–64.

Endlicher, S. (1843). Plantae Hortenses. *Bot. Zeitung (Berlin)* 1: 457–459.

Ewart, J. (1931). 'Flora of Victoria'. (University Press: Melbourne.) *Podosperma*, p. 1127.

General Committee on Botanical Nomenclature (1968). Conservation of generic names, IX. *Taxon* 17: 325–329.

Graham, R. (1842). *Podotheca gnaphalioides. Bot. Mag.* t. 3920.

Gray, A. (1851). Characters of some south-west Australian Compositae, principally of the subtribe Gnaphalieae. *Hook. J. Bot. Kew Gard. Misc.* 4: 227.

Grieve, B. J. & Blackall, W. E. (1975). 'How to know Western Australian Wildflowers'. pt 4. (University of Western Australia). *Podotheca*, pp. 824–825.

Hoffman, O. (1894). *Podotheca. In* Engler, A. & Prantl, K. 'Die naturlichen Pflanzenfamilien'. (Wilhelm Engelmann: Leipzig.) 4(5): 190–191.

Kunth, C. S. (1838). 'Flora berolinensis', ed. 2, vol. 1. (Berlin). '*Podosperma*', p. 379.

Labillardiére, J. H. H. de (1806). 'Nova Hollandiae plantarum specimen', vol. 2. (Paris). *Podosperma*, pp. 35–36, t. 177.

Lessing, C. H. (1832). 'Synopsis generum Compositarum'. (Berlin). '*Podosperma*', *Podotheca*, pp. 133, 272.

Maiden, J. H. & Betche, E. (1916). 'A census of New South Wales Plants'. (Govt. Printer: Sydney.) *Podotheca*, p. 201.
Merxmüller, H., Leins, P. & Roessler, H. (1977). Inuleae — systematic review. *In* Heywood, V. H., Harborne, J. B. & Turner, B. L. (eds), 'The biology and chemistry of the Compositae'. (Academic Press: London.) 1: 577–602.
Mueller, F. J. H. (1882). 'Fragmenta phytographiae Australiae', vol. 12. (Melbourne.) *Podosperma pollackii*, pp. 21–22.
Mueller, F. J. H. (1889). 'Second systematic census of Australian plants. Part 1. Vasclares'. (McCarron, Bird & Co.: Melbourne). *Podosperma*, pp. 134–135.
Mulcahy, M. J. & Bettenay, E. (1972). Soil and landscape studies in Western Australia. (1) The major drainage divisions. *J. Geol. Soc. Aust.* 18: 349–357.
O'Brien, T. P. & McCully, M. E. (1981). 'The study of plant structure. Principles and selected methods'. (Termarcarphi Pty Ltd: Wantirna, Victoria.)
Oliver, F. W. (1913). 'Makers of British Botany'. (Cambridge University Press.)
Rodway, L. (1903). 'The Tasmanian Flora'. (Govt. Printer: Hobart.) *Podotheca*, p. 96.
Schultz, C. H. (1834). Drei neue Pflanzengattungen. *Flora* 17: 465–479.
Short, P. S. (1981). Pollen-ovule ratios, breeding systems and distribution patterns of some Australian Gnaphaliinae (Compositae: Inuleae). *Muelleria* 4: 395–417.
Short, P. S. (1985). A revision of *Actinobole* Fenzl ex Endl. (Compositae: Inuleae: Gnaphaliinae). *Muelleria* 6: 9–22.
Short, P. S. (1986). A revision of *Pogonolepis* Steetz (Compositae: Inuleae: Gnaphaliinae). *Muelleria* 6: 237–253.
Short, P. S. & Sinkora, D. M. (1988). The botanist Joachim Steetz (1804–1862). *Muelleria* 6: 449–494.
Steetz, J. (1845). *Podotheca. In* Lehmann, J. G. C. (ed.), 'Plantae Preissianae'. (Hamburg). 1: 448–449.
Systematics Association Committee for Descriptive Terminology (1962). Terminology of simple, symmetrical plane shapes (Chart 1). *Taxon* 11: 145–156, 345–347.
Turner, B. L. (1970). Chromosome numbers in the Compositae. XII. Australian species. *Amer. J. Bot.* 57: 382–389.

Manuscript received 30 March 1988

NOTES ON THE FRUIT ANATOMY OF AUSTRALIAN MEMBERS OF THE INULEAE (COMPOSITAE)

by

P. S. Short*, K. E. Wilson* and J. Nailon†

ABSTRACT

Short, P. S., Wilson, K. E. & Nailon, J. Notes on the fruit anatomy of Australian members of the Inuleae (Asteraceae). *Muelleria* 7(1): 57–79 (1989). — Observations of the anatomy and morphology of Australian inuloid genera are presented. Genera examined include *Angianthus* Wendl. *s. lat.*, *Helichrysum* Miller, *Helipterum* DC., *Ixiolaena* Benth., *Millotia* Cass., *Myriocephalus* Benth., *Podolepis* Labill., *Scyphocoronis* A. Gray and *Toxanthes* Turcz. Comments on generic delimitation are made.

INTRODUCTION

As an adjunct to revisionary studies (by Short) of Australian genera a study of the fruit anatomy and morphology of species of Inuleae was commenced in 1982. Initial studies involved an assessment of the value of fruit anatomy in ascertaining specific and generic limits, an assessment carried out through the study of the segregate genera of *Angianthus* Wendl. *s. lat.* previously recognized by Short (1983). Following encouraging results a more general survey was carried out.

It is clear from studies that fruit characters are of much value in ascertaining generic limits within the Inuleae, and descriptions of fruit are incorporated in revisions of *Blennospora* A. Gray (Short 1987), *Podotheca* (Short 1989) and *Pogonolepis* Steetz (Short 1986a). Forthcoming revisions of *Calocephalus* R. Br., *Gnephosis* Cass. and *Chthonocephalus* Steetz (all *sensu* Benth. 1867) will also include descriptions of the fruit anatomy of many of the segregate genera that will be recognized. In this paper results of the studies of *Angianthus s. lat.* and miscellaneous observations of other inuloid genera are presented.

MATERIALS AND METHODS

The extent of the observations of the fruit anatomy and morphology of species in this paper vary considerably. In some cases anatomical comments are the result of the examination of median-transverse sections (TS) and median-longitudinal sections (LS) of fruit, in others only TS have been studied. Similarly not all species have been examined with a scanning electron microscope (SEM), surface features sometimes being only examined by light microscope using a 40× objective. The bracketed abbreviations LS, TS & SEM accompanying the generic headings below are used to indicate the extent of observations.

Voucher specimens are housed in either AD or MEL, the majority being in the latter herbarium. The appendix lists the specimens examined, giving species name, author citation and collector's name and number.

Immature fruit were fixed in the field in 4:3:1 (chloroform:absolute ethanol:glacial acetic acid) and subsequently stored in 70% ethanol. Mature, dry fruit were rehydrated and then fixed in 5% glutaraldehyde in 0·03 M Pipes buffer. Following fixation and dehydration both immature and mature fruit were infiltrated with G.M.A., Spurr's or L. R. White (London Resin Co.). Infiltration of L. R. White over several weeks, with repeated two hour vacuum infiltrations, proved to be the most effective. Two micron thick sections were stained with toluidine blue (pH 4·5) and mounted in histomount.

* National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.
† Department of Botany, Monash University, Clayton, Victoria, Australia 3168.

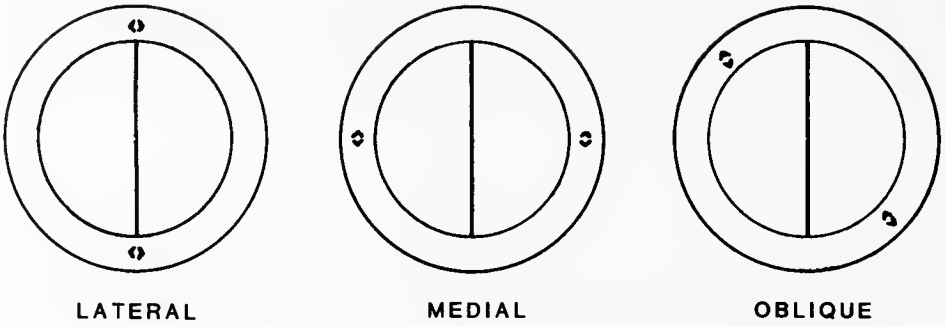

Fig. 1. The position of the vascular bundles in the pericarp in relation to the cotyledons.

To assist in the identification of vascular bundles in the pericarp fruit were cleared and stained in a solution of 1% basic fuchsin in 10% KOH (Wilcox 1977).

Terminology is generally self-explanatory and follows Bruhl (1984); the terms lateral, medial and oblique have been used to indicate the position of the vascular bundles in the pericarp and testa in relation to the cotyledons. In fruit with lateral vascular bundles the bundles occur in the plane of the upper surface of the cotyledons. In fruit with medial vascular bundles the bundles are opposite the lower surface of the cotyledons. If the position is intermediate between lateral and medial then bundles are considered to be oblique (Fig. 1). Placing the position of the bundles into one of the three categories did not usually present a problem. However, in some species any two bundles in a fruit were not opposite one another as illustrated in Fig. 1, but occupied different positions, e.g. one in a lateral position, the other in an oblique position. In a few species bundle position could not be determined as individual seedling leaves could not be discerned.

RESULTS AND DISCUSSION

General

Fruit anatomy, and to some extent morphology, has been generally ignored in taxonomic work in the Australian Asteraceae. A notable exception is the recent work on the Cotuleae (Bruhl 1984; Bruhl & Quinn 1988). Such studies are useful in deciding generic limits, a fact underlined by studies of most genera examined in this paper. This conclusion, plus the comments made below on the affinities of species and generic limits have been only reached following consideration of numerous morphological features of the taxa under discussion, not just fruit characteristics.

Fruit characteristics which are often indicative of species groups are:

a) presence or absence and structure of thick-walled tissue in the pericarp and/or testa, e.g. compare *Helipterum albicans* with other species of *Helipterum*.

b) presence or absence of a carpopodium, e.g. compare *Cephalosorus* and *Dithyrostegia* with other members of *Angianthus s. lat.* (also see Haque & Godward 1984).

c) structure of the epidermis including trichomes, e.g. compare *Cephalosorus* and *Pogonolepis*, with fruit virtually enveloped in myxogenic cells, with other members of *Angianthus s. lat.*

d) a crystalline pericarp, e.g. see *Craspedia*. Crystals are commonly found in the testa of most, if not all, inuloid species examined but not in the pericarp.

The presence or absence of vascular bundles in the testa may also be indicative of species groups, e.g. compare *Podolepis georgei* with other species of *Podolepis s. lat.* However, the reliability of our data is open to question. We stress that our observations of vascular bundles in the testa were only made from medial transverse sections. Ideally, cleared seed should be examined. Paul Wilson (pers. comm. 1988), following examination of cleared specimens, has recorded different results to us for

Table 1. Fruit characteristics in species of *Helipterum*.
(+ = present; − = absent or not applicable; L = lateral; M = medial; Ob = oblique; ? = number of vascular bundles not clear or position not known because cotyledons absent from section; ( )* = number of vascular bundles observed in cleared fruit (see text, p. 59).

	Layer of collenchyma or sclerenchyma in pericarp	Number of vascular bundles in pericarp in TS	Position of vascular bundles in pericarp	Number of vascular bundles in testa in TS	Position of vascular bundles in testa	Lateral thickening of epidermal cell walls
H. albicans	+	2	L	0	−	−
H. charsleyae	+	2	Ob	2	Ob	−
H. chlorocephalum	−	2	M	1	M	−
H. floribundum	−	2	?	1	?	−
H. maryonii	−	2	Ob/M	0(1)*	−	−
H. microglossum	−	2	?	1(?2)	?	?
H. moschatum	−	2	M/Ob	0(1,2)*	−	+
H. pygmaeum	±	2	M	1(?2)	M	+
H. strictum	−	2	Ob	2	Ob	−
H. stuartianum	−	2	M	0	−	−
H. uniflorum	−	2	Ob	0(1)*	−	+

some species of *Helipterum* (see Table 1). He has also recorded the presence of a vascular bundle in the testa of *Triptilodiscus*. We observed none in TS. The discrepancy in the data partly reflects the occasional difficulty in recognizing bundles in TS. However, it also reflects variation in the location of vascular bundles and the extent of vascularization in the testa. Observations by Paul Wilson indicate that a single vascular strand enters the testa through the funicle and penetrates a varying distance into the testa. Very often strands do not reach the apex of the ovule and the extent to which strands penetrate the testa may also vary within the one species. On entry to the ovule the strand may remain undivided or divide into two.

The position of the vascular bundles in the pericarp or testa is rarely constant in any species group, e.g. in *Angianthus s. str.* On the other hand, in *Podotheca s. str.* only oblique bundles occur in the pericarp of the five species examined (Short 1989).

The possible occurrence of a reticulate venation pattern in the pericarp has been alluded to for *Craspedia* aff. *pleiocephala*. Of all species included in the general survey, including species in genera under revision and not included here, only *Gnephosis gynotricha* Diels definitely has reticulate venation. This pattern is absent from its close relative *G. macrocephala* Turcz.

In some species it was difficult, from transverse sections, to differentiate with certainty the testa from the pericarp. Sometimes this problem was overcome through the examination of sections of immature fruit. With many sections a clear gap exists between the layers of tissue considered to be testa and pericarp but in some species the tissue layers are all but obliterated in mature fruit. Thus it is possible that mistakes have been made in our interpretation of these tissues. Paul Wilson (*in litt.* 1987) has noted that, in *Blennospora*, a layer of sclerenchyma previously deemed to be in the pericarp (Short 1987) is more likely to be the outer layer of the testa. However, although the correct elucidation of testa and pericarp is critical for broad comparisons of composite genera, it is not so important for discerning species groups within unnatural genera. Differences in characters such as the presence or absence of sclerenchyma in the combined fruit/seed wall and the total number of vascular bundles are still useful features for indicating species affinities.

ACTINOBOLE Fenzl ex Endl. (LS, TS, SEM)

Fruit sections were obtained for each of the four species recognized in the genus (Short 1985). They are seemingly identical. All possess a prominent stylopodium, lack a distinct carpopodium, are covered with twin-myxogenic hairs, and have two oblique vascular bundles in the pericarp. Vascular bundles are lacking from the testa (Figs 2a–b, 5d).

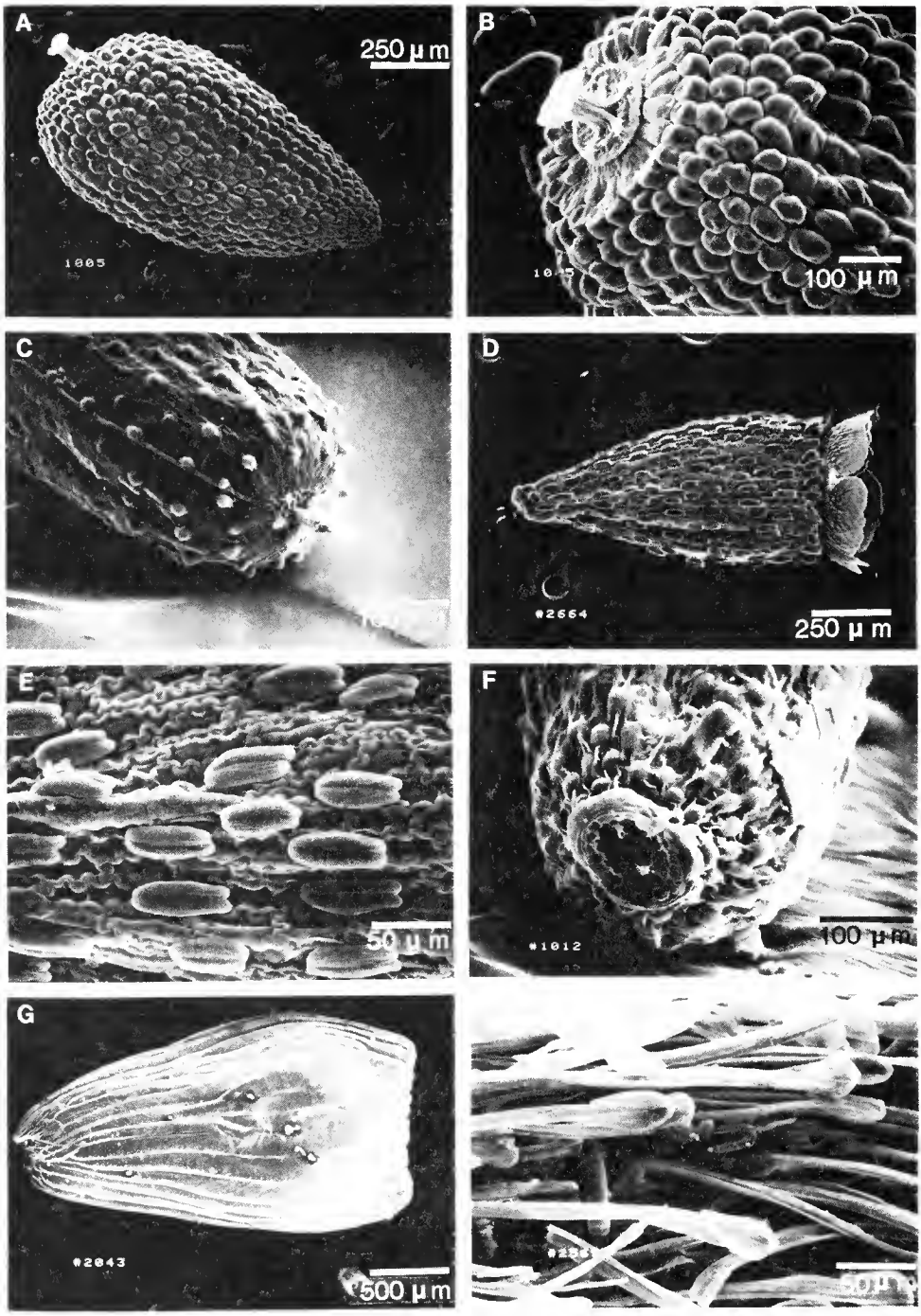

Fig. 2. Surface features of fruit. a,b — *Actinobole condensatum*, general view and apex showing the prominent stylopodium (*Short 1005*). c — *Angianthus acrohyalinus*, upper half of fruit with the position of the vascular bundle visible (*Short 1000*). d,e — *Angianthus* aff. *micropodioides*, general view and myxogenic hairs (*Short 2664*). f — *Angianthus* aff. *milnei*, carpopodium (*Short 1012*). g — *Cephalosorus carpesioides*, general view (*Short 2043*). h — *Chondropyxis halophila*, trichomes (*Short 2565*).

ANGIANTHUS Wendl. *s. lat.*

In a recent revision (Short 1983) of *Angianthus s. lat.* eight genera were reinstated. Genera were recognized on the basis of a number of characters, including leaf morphology and the number, arrangement and morphology of the bracts of both the general involucre and capitula. Fruit characteristics were also used but additional notes on fruit structure are reported here.

Angianthus Wendl. *s. str.* (TS, SEM)

Species of *Angianthus* have a thin pericarp containing no thick-walled tissue. In all species it is difficult to differentiate the testa from the pericarp. In some sections a more or less well-defined, one-cell wide layer could be discerned. The cells have slightly thickened walls and it is probably the outer layer of the testa. Vascular bundles were not observed in the testa but two occur in the pericarp. The vascular bundles are oblique in *A. cunninghamii* and *A. acrohyalinus* but in *A. drummondii* they are almost medial. In both *A. brachypappus* and *A. milnei* one vascular bundle is in the lateral position, the other is oblique. Due to the thinness of the pericarp the position of the vascular bundles is often visible on the fruit surface as a small ridge (Fig. 2c). A carpopodium is well developed in all species (Figs 2d, f), and apparently twin-celled, myxogenic papillae occur on the fruit surface of most species (Figs 2c–f).

Cephalosorus A. Gray (LS, TS, SEM)

Cephalosorus is a monotypic genus. Fruit of *C. carpesioides* have an outer layer of myxogenic cells (Figs 2g, 5c). Two, more or less lateral vascular bundles occur in the pericarp. Vascular bundles were not observed in the testa, and thick-walled tissue is absent from both the testa and pericarp. A carpopodium is absent or poorly developed with the dehiscence region being in a pronounced basal hollow due to the large, myxogenic cells enveloping the fruit.

Dithyrostegia A. Gray (SEM)

Dithyrostegia contains two species, *D. amplexicaulis* and *D. gracilis* P. Short. Unlike all other species once referred to *Angianthus s. lat.* both have fruit enveloped by elongate, somewhat rigid hairs (Figs 3a, b). A carpopodium is absent.

Epitriche Turcz. (LS, TS, SEM)

Fruit of the only species, *E. cuspidata*, was not closely examined before the mounted sections had considerably faded. However, longitudinal sections revealed an unusual feature, that of a several cell-wide cap of sclerified tissue at the apex of the fruit. The pericarp, of which the cap is part, was barely sclerified in the TS of the fruit.

Hyalochlamys A. Gray (TS)

Hyalochlamys globifera A. Gray, the only member of the genus, has a more or less obpyriform, glabrous fruit with a well developed carpopodium. The pericarp is thin, lacks thick-walled tissue and contains two vascular bundles.

Pleuropappus F. Muell. (TS, SEM)

Angianthus phyllocalymmeus was referred (Short *l.c.*), with some apprehension, to *Pleuropappus*. Not only does the species superficially resemble many species of *Angianthus s. str.*, but it also has four capitular bracts which are arranged in the same manner as in *Angianthus*. However, *Pleuropappus* can be distinguished by the fruit, which are oblique to the corolla tube, the oblique pappus, and the presence and arrangement of about four capitulum-subtending bracts. The oblique orientation of the fruit does not occur in any other member of *Angianthus s. lat.*, although this same feature is found in *Rutidosis* (see below).

Transverse sections of fruit show no major anatomical differences between *P. phyllocalymmeus* and members of *Angianthus s. str.* The fruit wall is thin and the two vascular bundles, which only occur in the pericarp, are oblique (Fig. 12c). A carpopodium is also well developed in *Pleuropappus*. These observations do not support the reinstatement of the genus.

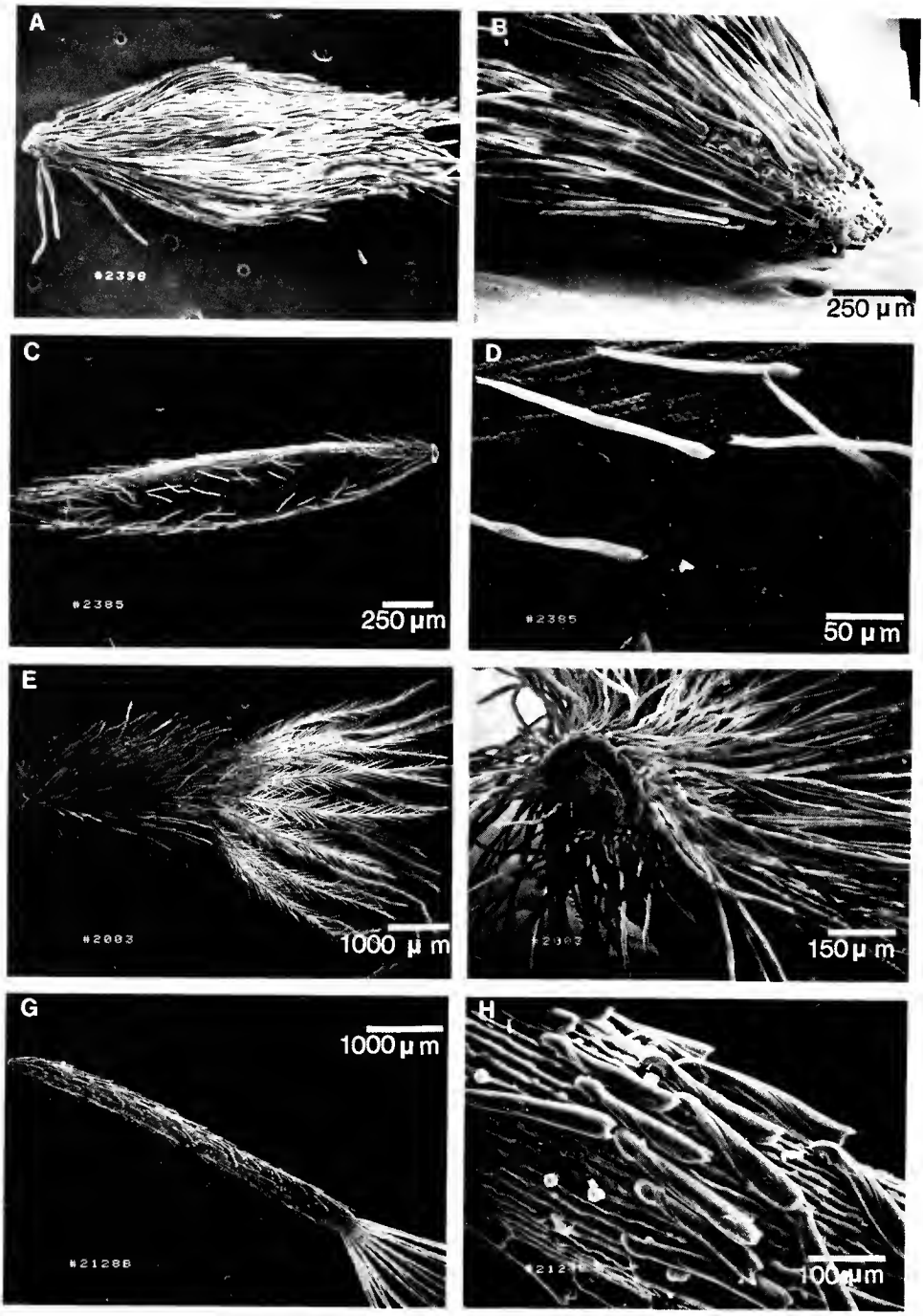

Fig. 3. Surface features of fruit. a,b — *Dithyrostegia amplexicaulis*, general view and base, note absence of carpopodium (*Short 2398*). c,d — *Gnephosis pygmaea*, general view and trichomes (*Short 2385*). e,f — *Helipterum charsleyae*, general view and carpopodium (*Short 2003*). g,h — *Millotia myosotidifolia*, general view and trichomes (*Short 2128B*).

Pogonolepis Steetz (LS, TS, SEM)

The outermost layer of the pericarp of species of *Pogonolepis* is composed of myxogenic cells (see Fig. 7, Short 1986a). There is also a pronounced carpopodium. Layers of thick-walled tissue are absent from both the testa and pericarp. Two vascular bundles, more or less in the lateral position, occur in the pericarp (Fig. 10b). Vascular bundles were not observed in the testa. *Pogonolepis* and *Cephalosorus* are the only genera in *Angianthus s. lat.* to have species with the myxogenic cells covering the surface of the fruit. Despite this similarity they are not closely related, differing in many inflorescence and leaf characters.

Siloxerus Labill.

This genus, containing three species, was not closely examined for this paper. However, the cypselae are readily distinguished from those of other segregate genera by their colour alone. Beside the purple colour the small fruit are sparsely to densely papillose and lack a carpopodium.

In the revision of *Angianthus s. lat.* (Short *l.c.*) three species, each clearly without close affinities with *Angianthus s. str.*, were treated as species of uncertain affinity. Each is now referred to a different genus, viz *Fitzwillia* P. Short, *Lemooria* P. Short and *Sondottia* P. Short (Short 1989). Fruit of *F. axilliflora* have some similarities with those in *Angianthus s. str.* in that in TS the fruit wall is thin, thick-walled tissue is lacking in either the testa or pericarp and there are two, oblique/medial vascular bundles in the pericarp. However, a carpopodium is absent, a capping of sclerenchyma occurs at the fruit apex and the entire surface is covered with long, intertwined hairs. Fruit sections of *S. connata* (W. V. Fitzg.) P. Short have not been obtained. The fruit surface in this species is glabrous and there is a well developed carpopodium. Fruit sections of *L. burkittii* faded before they were closely examined. Nevertheless it is evident that this species has two vascular bundles in the pericarp and that a few papillae are scattered over the fruit surface. Thick-walled tissue seems to be absent from the pericarp and testa.

Chondropyxis D. Cooke (SEM)

Chondropyxis halophila was included by its author (Cooke 1986) in the Anthemideae but with the comment that, along with *Ceratogyne* Turcz., *Dimorphocoma* F. Muell. & Tate, *Elachanthus* F. Muell. and *Isoetopsis* Turcz. it formed a group with closer affinities to Astereae than Anthemideae. Bremer (1987) has suggested that *Isoetopsis* is a member of the Inuleae (subtribe Pluchinae). If this is the case then *Chondropyxis* possibly should be placed in the Inuleae. It is included in the current paper because of the distinctive hooked hairs which occur on the fruit (Fig. 2h), a form of trichome which does not seem to be widely distributed in the tribe.

Craspedia Forst. f. (TS)

Fruit of two species currently included within *Craspedia* have been examined. One, *Short 853*, is a New Zealand member of the *C. uniflora* complex. The other species, *Short 837*, possibly *C. pleiocephala*, was collected in South Australia.

The New Zealand taxon has fruit with a thin pericarp (two cells wide) which lacks thick-walled cells and contains two vascular bundles in the lateral/oblique position. The testa lacks thick-walled tissue and vascular bundles were not observed. Externally the fruit are minutely papillate, occasionally have a sparse cover of long trichomes, and possess a prominent annular carpopodium.

Craspedia aff. pleiocephala has two, oblique vascular bundles in the pericarp (Fig. 5a). Two to three scattered vessels were observed in some sections suggesting the presence of a reticulate venation system. However, the most striking aspect of this species was the presence of large, usually more or less oblong crystals in the pericarp. The crystals are not scattered but make up much of the pericarp, cell detail being obscured. Externally the fruit are silky hairy and lack a prominent, annular carpopodium.

Craspedia, as currently delimited, is a heterogeneous group. Arid zone taxa such as *C. pleiocephala* and *C. chrysantha* (Schdl.) Benth. certainly have a superficial

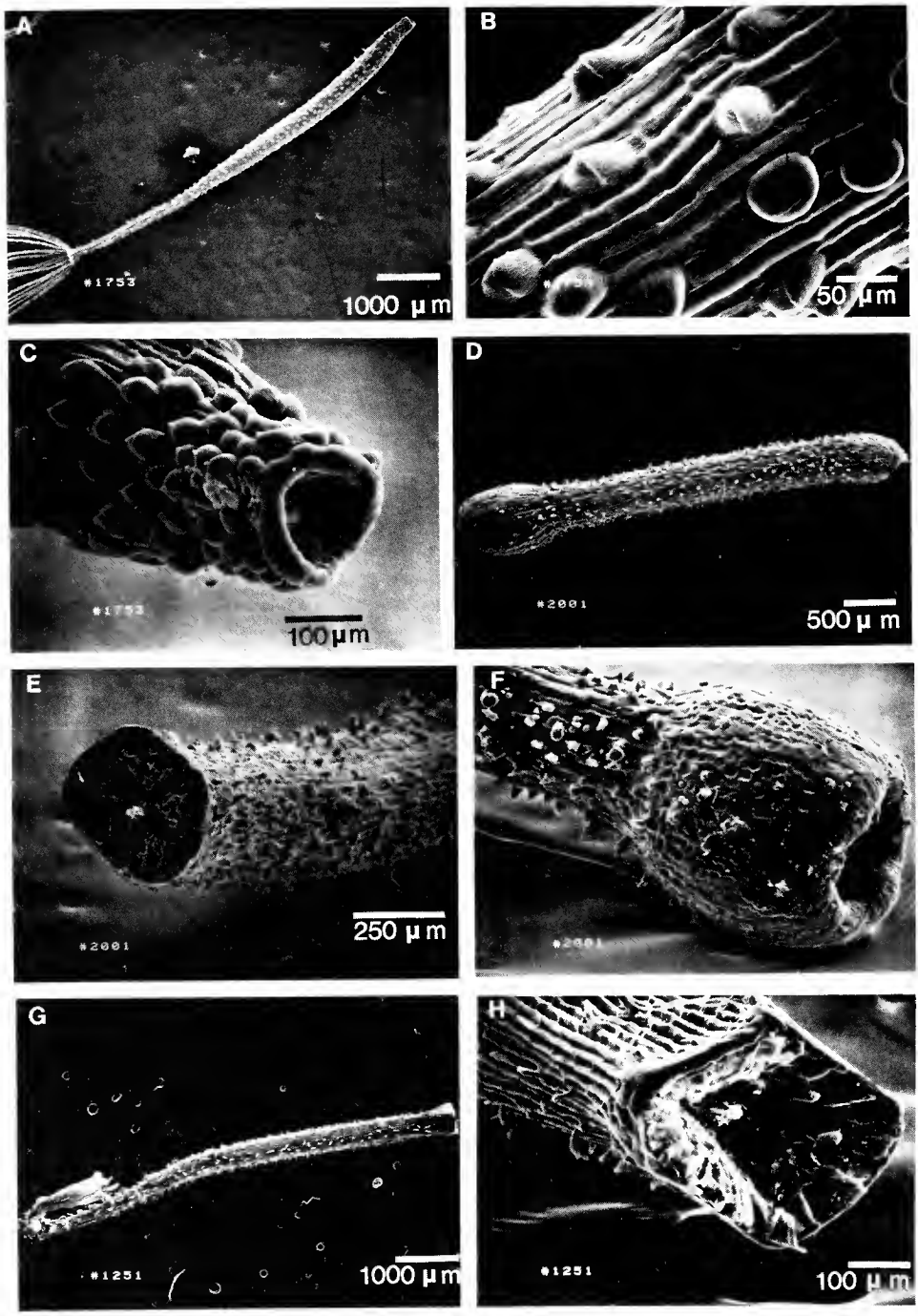

Fig. 4. Surface features of fruit. a,b,c — *Millotia tenuifolia*, general view, myxogenic papillae and carpopodium (*Short 1753*). d,e,f — *Scyphocoronis incurva*, general view, base lacking carpopodium and hollow apex (*Short 2001*). g,h — *Toxanthes muelleri*, general view (corolla attached) and carpopodium (*Short 1251*).

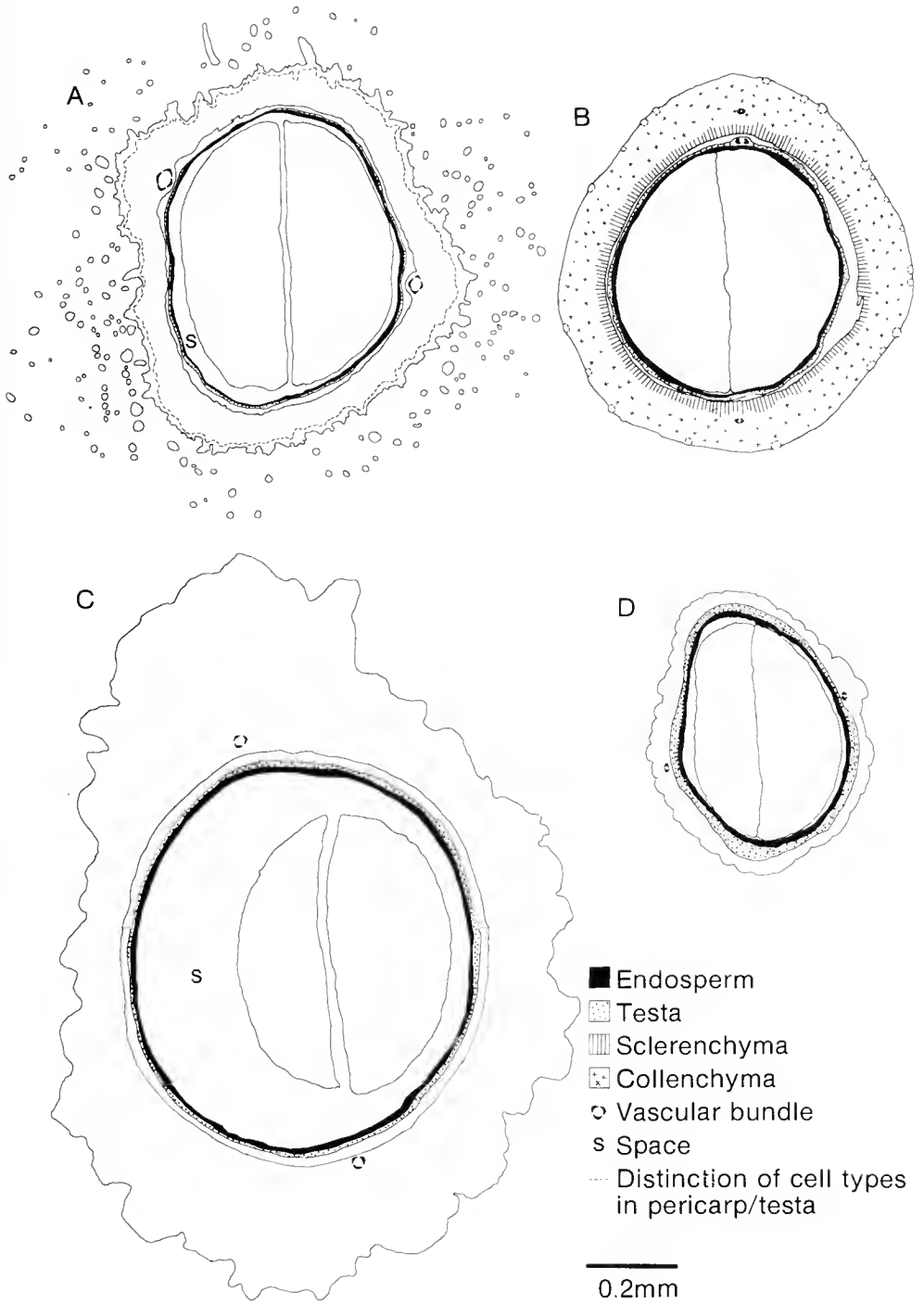

Fig. 5. Transverse sections of fruit. a — *Craspedia* aff. *pleiocephala* (*Short 837*). b — *Helichrysum bracteatum* (*Short 3022*). c — *Cephalosorus carpesioides* (*Short 2403*). d — *Actinobole condensatum* (*Short 1005*).

resemblance to *Craspedia s. str.* [which includes the many, mainly alpine, species commonly referred to the *C. uniflora* and *C. glauca* (Labill.) Spreng. complexes] and all are united in *Craspedia s. lat.* by the presence of receptacular scales. However, cytological evidence and that presented above does not support the current circumscription of the genus. *Craspedia pleiocephala* has a haploid chromosome number of $n = 6$ (Short 1981, 1986b) whereas members of *Craspedia s. str.* have a base number of $x = 11$ (Turner 1970; Beuzenberg & Hair 1984). The observed differences in the fruit are certainly major, with the largely crystalline pericarp seen in *C.* aff. *pleiocephala* not being observed in any of the other genera examined.

HELICHRYSUM Miller (TS)

Helichrysum, in the broad sense, occurs in Eurasia, Africa, Madagascar, Australia and New Zealand and contains about 500 species (Merxmüller *et al.* 1977). The artificiality of the genus is widely recognized, with Bentham (1867, p. 162) noting that 'the limits to be assigned to the group are very uncertain, as it is connected with so many others by insensible gradations'. Using features such as habit, shape of the involucre and receptacle, bract morphology, pappus structure, and vestiture of the cypsela, Bentham (*l.c.*) erected six Sections to accommodate Australian species of *Helichrysum*. Given the array of morphological variation exhibited there seems no doubt that in years to come most, in fact probably all, Australian species currently placed in *Helichrysum* will be referred to a number of segregate genera, e.g. *Chrysocephalum* Walp. and *Lawrencella* Lindley. Only four species of *Helichrysum* were examined in this study but observations of fruit anatomy support this contention.

Helichrysum apiculatum, a name applied to a large number of taxa deserving specific recognition, was referred by Bentham to Sect. *Chrysocephalum* (Walp.) Benth. Fruit of the taxon examined displayed a thin pericarp with two, oblique vascular bundles (Fig. 11f). Thick-walled tissue was absent from the pericarp and testa, and vascular bundles were not observed in the testa. There is a prominent, annular carpopodium.

Helichrysum bracteatum in Sect. *Xerochlaena* Benth., is another polymorphic species. The fruit examined have a pericarp which is 14–15 cells wide and primarily consists of collenchyma, but there is a gradation to sclerenchyma, with the innermost 3–5 cell wide layer being solely of the latter tissue. Two lateral vascular bundles occur in the pericarp and two more occur in the testa (Fig. 5b).

Helichrysum leucopsideum, also placed by Bentham in Sect. *Xerochlaena*, has a 4–8 cell wide collenchymatous pericarp (Figs 7a, 11b). Sclerenchyma is absent. As with *H. bracteatum* this species has two vascular bundles in the pericarp, but they have a medial, not a lateral orientation. A single vascular bundle was observed in the testa.

Helichrysum cassinianum was referred by Steetz (1845) to *Schoenia* Steetz and this was followed by Bentham (1867). Haegi (1986) referred it to Sect. *Lawrencella* (Lindley) Benth. of *Helichrysum*, commenting that 'further studies are likely to confirm the placement of all these related species in a distinct genus *Lawrencella* Lindley' (p. 1526). The large, coarsely silky, compressed fruit readily distinguish it from other species examined, but it has similarities with *H. leucopsideum* in that there are two medial vascular bundles and a layer of collenchyma (2–4 cells wide) in the pericarp. Unlike *H. leucopsideum* two vascular bundles were seen in the testa (Figs 6, 11g).

HELIPTERUM DC. (TS, SEM)

Despite its illegitimacy the generic name *Helipterum* DC. is commonly applied to about 100 species from Africa and Australia. As with *Helichrysum* it is well known to be an unnatural genus (e.g. Short 1983, Wilson 1987), a fact underlined by our examination of the fruit anatomy of 11 Australian species.

The fruit section of *H. albicans* subsp. *albicans* var. *buffaloensis* is markedly different from that obtained for other species of *Helipterum*. It has two layers, each one-cell wide, of sclerenchyma and two, lateral vascular bundles in the pericarp (Figs

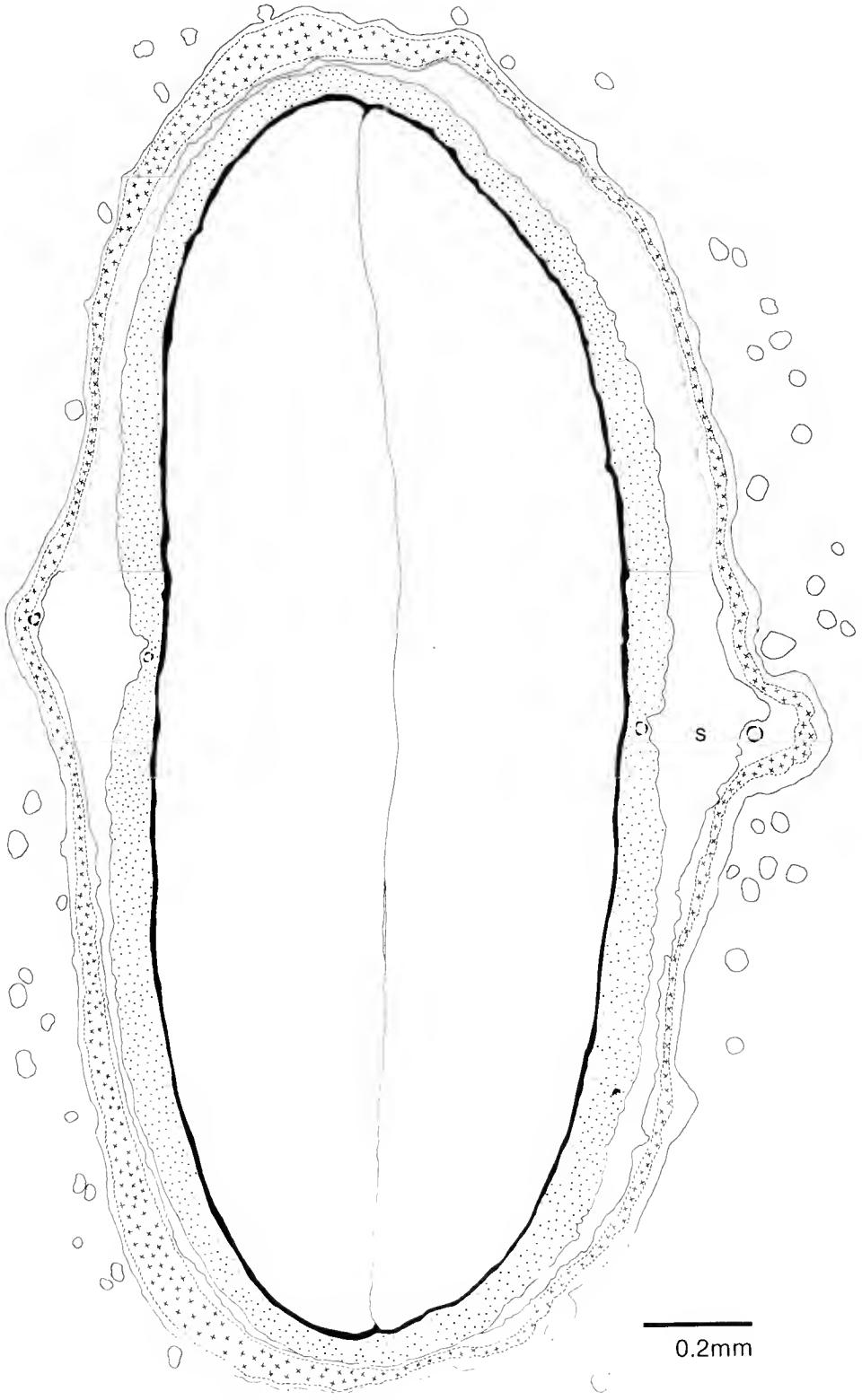

Fig. 6. Transverse section of fruit of *Helichrysum cassinianum* (*Short 1575*).

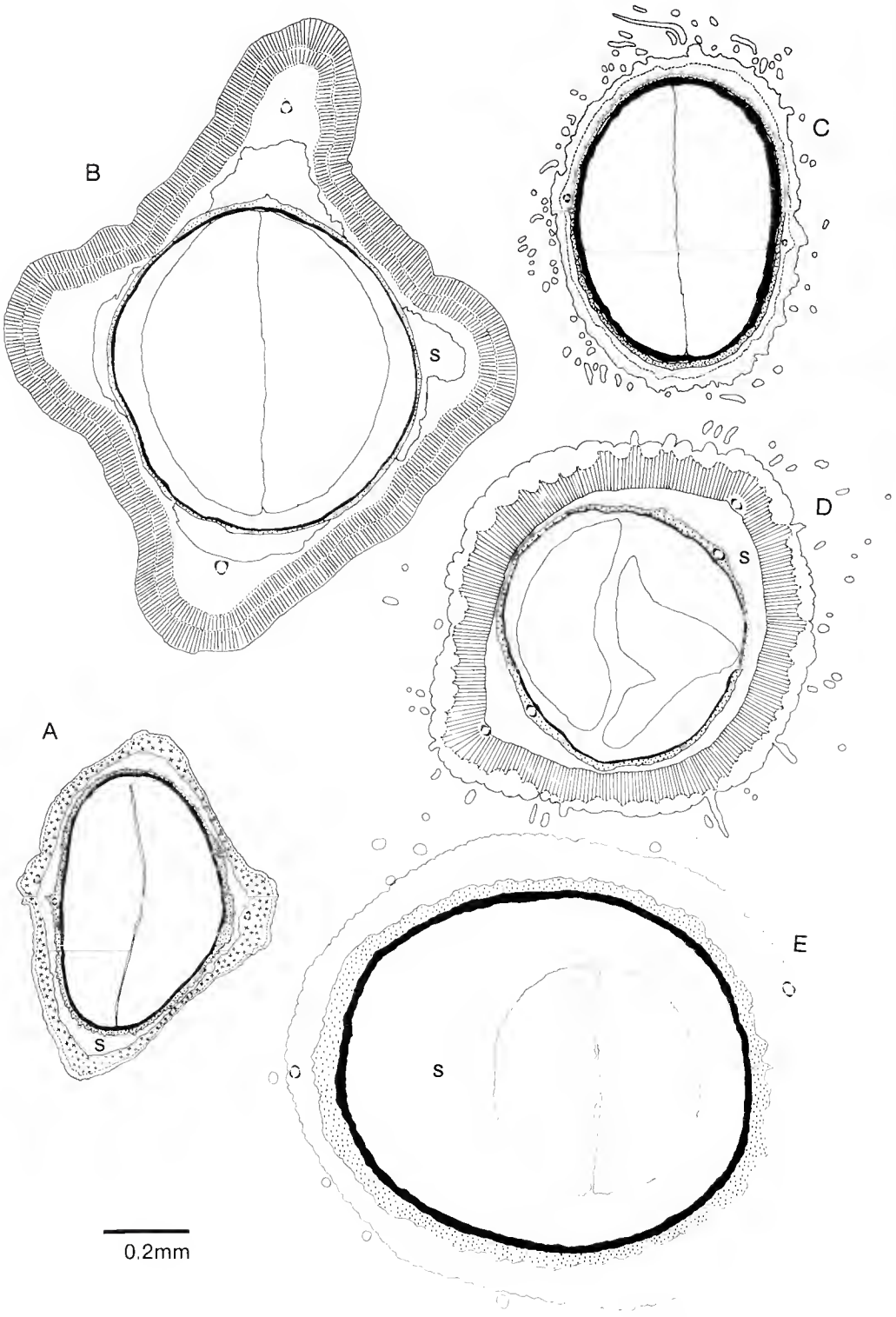

Fig. 7. Transverse sections of fruit. a — *Helichrysum leucopsideum* (*Short 1554*). b — *Helipterum albicans* subsp. *albicans* var. *buffaloensis* (*Short 1403*). c — *Helipterum pygmaeum* (*Short 2973*). d — *Helipterum charsleyae* (*Short 2003*).

7b, 11c). Vascular bundles were not observed in the testa. The *H. albicans* species group, revised by Wilson (1960), is undoubtedly generically distinct from other species currently included in *Helipterum*.

Helipterum charsleyae is also one of several species which probably constitute a distinct genus (Short 1989). Unlike other species examined it has a layer of sclerenchyma, 4–6 cells wide, in the pericarp. There are two vascular bundles in both the pericarp and testa (Fig. 7d). The fruit has a prominent carpopodium and is enveloped in long trichomes with bifid apices (Figs 3e, f).

Pericarps of fruit of the remaining nine species examined lack at least a complete layer of collenchyma or sclerenchyma, but in *H. pygmaeum* there is a scattering of thick-walled cells (not depicted in Fig. 7c) in what appears to be the inner layer of the pericarp. However, in this species and *H. microglossum*, *H. strictum* and *H. uniflorum* the distinction between testa and pericarp was not obvious in TS of mature fruit. Species differ from one another in characters such as the number of vascular bundles in the testa, the vestiture of the cypsela and the presence or absence of lateral thickening of the cell walls in the epidermis (Fig. 11e; see table 1).

IXIOLAENA Benth. (TS)

Bentham (1837), when describing the new genus *Ixiolaena*, recognized a single species, *I. viscosa* Benth. Subsequently he referred a further four species, i.e. *I. brevicompta*, *I. leptolepis*, *I. supina* and *I. tomentosa* to the genus (Bentham 1867). Moore (1903) described a further species, *I. websteri*, and recently Haegi (1986) described *I. chloroleuca* and *I. pluriseta*.

Specimens of *I. websteri* and *I. pluriseta* have not been seen, but studies of the other species currently included in the genus suggest that *Ixiolaena s. str.* includes only *I. viscosa*. The habit, the presence of white laminae on the middle bracts of the involucre, and the lower petiolate leaves set this species apart from all others. Fruit of *I. viscosa* also differ from those described below in that they are not angular, are brown-black and have prominent, elongate papillae scattered over much of the surface. This species is also restricted to the comparatively high rainfall areas of south-western Australia, its supposed congeners are primarily species of eremaean Australia. *Ixiolaena websteri* is apparently a rhizomatous, branched shrub and has female as well as bisexual forets (Grieve & Blackall 1975; Moore *l.c.*) suggesting it is not closely related to other species currently included in *Ixiolaena*. A number of inflorescence, fruit, and vegetative characters suggest that the remaining species form a natural group, to which a further species, *Leptorhynchos panaetioides* (DC.) Benth. shows affinities.

Fruit of four species, *I. brevicompta*, *I. chloroleuca*, *I. leptolepis* and *I. tomentosa* have been examined (Figs 8a–d, 11i). In many ways the cypselae of each species are very similar. All are brown, more or less oblong and have three to five somewhat obscure to prominent longitudinal ribs. An annular carpopodium occurs in all species, although in *I. chloroleuca* it is almost obscured by basal, myxogenic cells. In transverse section the pericarp displays an outer sclerenchymatous layer and has two vascular bundles. A single vascular bundle was noted in the testa, and the outer one-cell wide layer of the testa consists of cells with pronounced, more or less, U-shaped thickening (Fig. 11i).

The fruit of the aforementioned species differ from each other in a number of ways, including the prominence of the ribbing, vestiture, and the position of the vascular bundles in the pericarp. *I. brevicompta* has several attributes which set it apart from the others. The cypselae of this species has a vestiture of glandular hairs on the upper *c.* $\frac{1}{3}$ of the body. Other species have glabrous fruit or only a few glandular hairs at the apex. The vascular bundles of the pericarp are more or less in the lateral position, not the medial position as occurs in *I. chloroleuca* and *I. tomentosa*. (Their position could not be determined in *I. leptolepis*.) *I. brevicompta* also lacks, or has very few, two-celled myxogenic cells embedded in the sclerenchymatous epidermal layer of the pericarp. Such cells are common in the other species. Although obvious in transverse section their presence is not readily observed under low magnification.

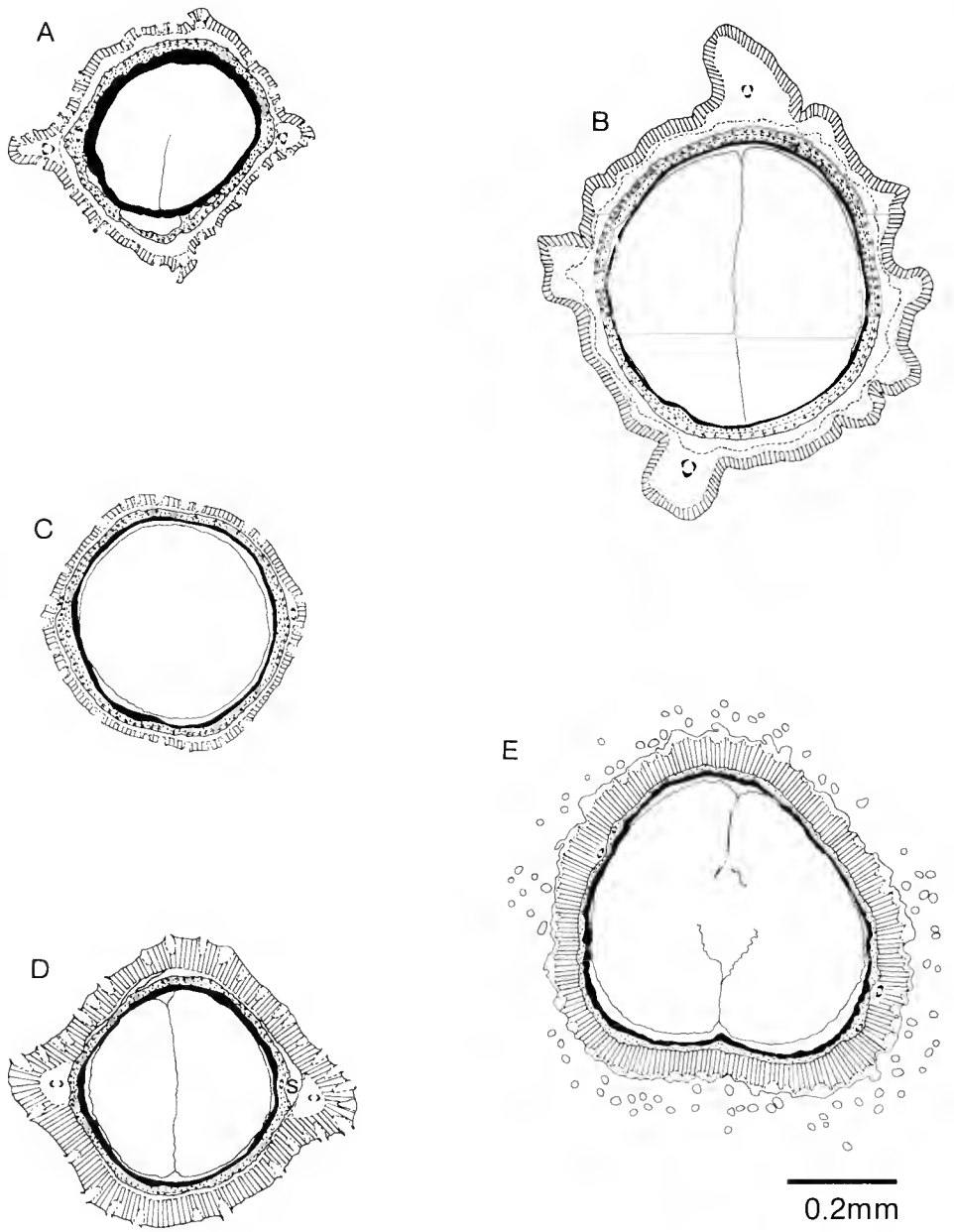

Fig. 8. Transverse sections of fruit. a — *Ixiolaena tomentosa* (*Short 2988*). b — *Ixiolaena brevicompta* (*Short 3018*). c — *Ixiolaena leptolepis* (*Short 2990*). d — *Ixiolaena chloroleuca* (*Short 3003*). e — *Myriocephalus stuartii* (*Czorney 1160*).

However, after soaking in water for 24 hours, fruit with these cells are found to be encased in a layer of mucilage. Despite prolonged soaking, such a layer was never evident in *I. brevicompta*. The latter species also differs from others by having the mature ovule contained in the lower $\frac{2}{3}$ of the fruit, not virtually filling the whole fruit.

Longitudinal sections of *I. brevicompta* were not obtained but the upper $\frac{1}{3}$ of the cypsela consists of sclerenchyma, i.e. it is a continuation of the outer layer of the pericarp. (If the upper part of the fruit was more narrow it would no doubt be deemed to be a 'beak' as in *Leptorhynchos*, *Millotia* etc.).

A further difference between species occurs in the width of the sclerenchymatous layer. In *I. chloroleuca* the layer is 3–4 cells wide, in other species it is only a single cell wide. The outermost layer of sclerenchymatous cells in *I. chloroleuca* is composed of much larger cells than those of the inner layers and is comparable in structure to that observed in other species.

LEPTORHYNCHOS Less. (TS)

As currently defined *Leptorhynchos* is a genus of about ten species. Transverse sections of fruit of the single species examined, *L. tetrachaetus*, reveal a pericarp which lacks a layer of sclerenchyma and has two vascular bundles which are probably in the oblique position. A further layer, probably the outer, one-cell wide layer of the testa consists of cells with U-shaped thickening. Vascular bundles were not observed in the testa. Externally the fruit is papillose and has an annular carpopodium.

Haegi (1986) noted the difficulty of distinguishing some species from groups of species in *Helichrysum* and *Waitzia* Wendl. We have noted above that *L. panaetioides* has strong affinities with many species currently placed in *Ixiolaena*.

MILLOTIA Cass., SCYPHOCORONIS A. Gray & TOXANTHES Turcz. (LS, TS, SEM)

Schodde (1963), in a revision of *Millotia*, noted a close relationship between this genus, and *Scyphocoronis* and *Toxanthes*. He reported that *S. majus* (Turcz.) Druce is almost morphologically identical to *T. muelleri* except for the hollow cup-like apex of the fruit. He further noted that an undescribed species had the habit, indumentum, and involucre of *Toxanthes*; the fruit of *Scyphocoronis*; and the alternate leaves, peduncles, floret form, free bracts and peduncles typical of some species of *Millotia*. (This species has since been named *S. incurva*.) Despite the intricacy of the relationships each genus was maintained.

Sections, both TS and LS, show a marked similarity in the fruit of species examined. All possess a layer of sclerenchyma in the pericarp (Fig. 12h). The seed is always enclosed in the lower portion of the fruit, and whether or not it tapers to a distinct beak or forms a hollow apex, the upper part of the fruit is formed of sclerenchyma, this being a continuation of the same layer of tissue surrounding the seed. Of the species examined all but *M. myosotidifolia* have only two vascular bundles in the pericarp; the latter has four.

There is some variation in two aspects, i.e. the carpopodium and the vestiture (Figs 3g–h, 4a–h). A carpopodium is best developed in species of *Millotia* and is absent or at least less well developed in *Toxanthes* and *Scyphocoronis*. However, it is not well developed in all *Millotia* species, e.g. in *M. greevesii* F. Muell. and *M. macrocarpa* Schodde it is much less prominent than in *M. myosotidifolia*. More marked are differences in the vestiture of the fruit. Distinct, apparently two-celled, myxogenic papillae occur on the surface of species of *Millotia*. In *M. myosotidifolia* and *M. inopinata* Schodde they are particularly elongated and appressed (Fig. 3h). Papillae of this type seem to be absent from *Scyphocoronis* and *Toxanthes* but trichomes do occur over much of the fruit surface in these genera. Their structure could not be readily determined, however, at least some of the trichomes are glandular. Most importantly such glandular trichomes have been observed towards the apex of fruit of *M. greevesii*, *M. macrocarpa* and *M. tenuifolia*. They were not observed in *M. myosotidifolia*.

Unless considerable emphasis is placed on the difference in fruit vestiture then the anatomical work adds little support to Schodde's contention that the three genera be maintained.

MYRIOCEPHALUS Benth. (TS, SEM)

As previously noted (Short 1983; Wilson 1987) the genus *Myriocephalus*, as circumscribed by Bentham (1867), is an unnatural group, a fact underlined by our studies of fruit anatomy of some species. *M. gracilis* differs from all other species

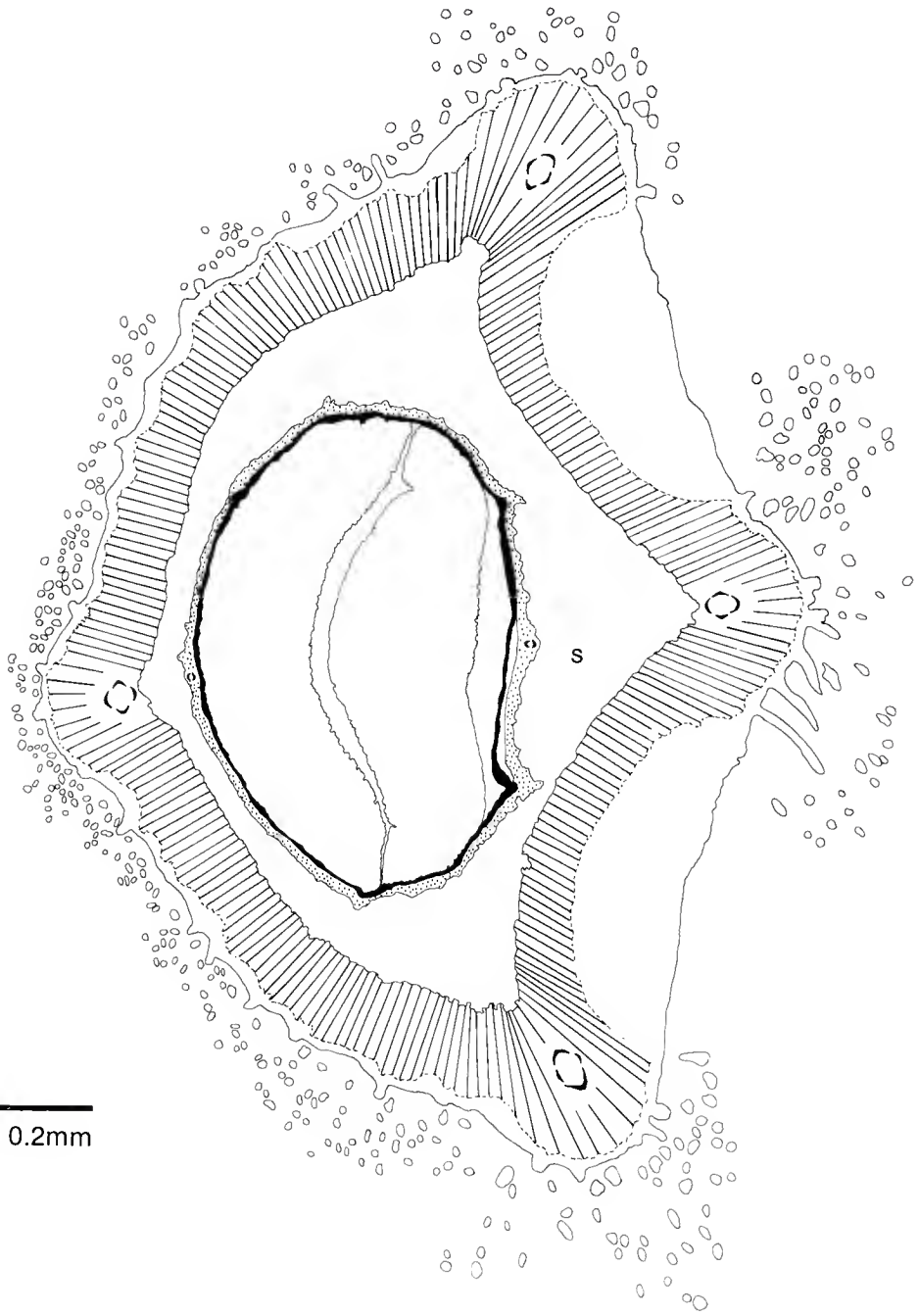

Fig. 9. Transverse section of fruit of *Myriocephalus guerinae* (*Short 540*).

currently included in the genus by bract characters and fruit anatomy. The fruit is covered by a semi-transparent layer of myxogenic cells, and has two medial or oblique vascular bundles in the pericarp. A layer of sclerenchyma, observed in the pericarp of the sectioned species of *Myriocephalus*, is absent or only partially developed in the

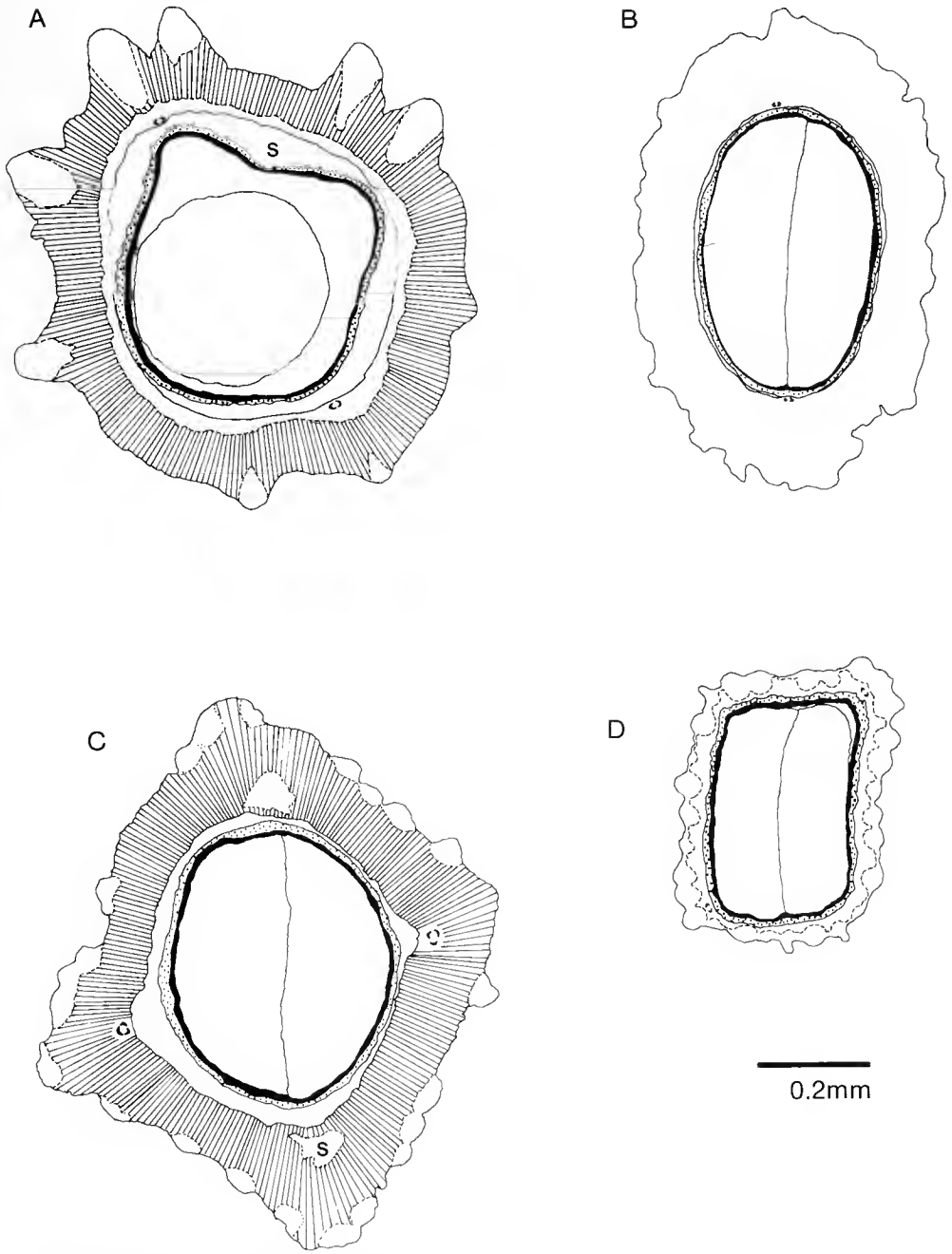

Fig. 10. Transverse sections of fruit. a — *Rutidosis helichrysoides* (*Short 2999*). b — *Pogonolepis stricta* (*Short 2086*). c — *Podolepis arachnoidea* (*Willis s.n.*, MEL 1554024). d — *Podolepis gracilis* (*Willis s.n.*, MEL 611247).

fruit of *M. gracilis* and seems to be part of the testa, not the pericarp. The affinities of *M. gracilis* are with species of *Helipterum s. lat.*

Myriocephalus helichrysoides A. Gray, *M. nudus*, *M. pluriflorus* (J. M. Black) D. Cooke, *M. rhizocephalus* (DC.) Benth. and *M. rudallii* (F. Muell.) Benth. plus *Gnephosis pygmaea* form a distinct group, with all species having similar fruit and

pappus characteristics. All have more or less narrow ellipsoid fruit with a sparse covering of straight twin hairs, and an annular carpopodium. A pappus is either absent or consists of a single bristle. The only species sectioned, *M. nudus* and *G. pygmaea*, display a testa with a crystalline layer, and a pericarp with a single, or mainly single, cell-wide layer of sclerenchyma (Fig. 11b) and two lateral vascular bundles. Three species, *G. pygmaeus*, *M. nudus* & *M. rhizocephalus*, have been viewed with the SEM. The fruit surface of each species displays a wave-like pattern caused by thickening in cells of the epidermis (Fig. 3d). Although showing similar fruit morphologies the species of this group have not been thoroughly examined in regard to inflorescence structure, and given the habit differences displayed by the species (e.g. compare *M. rhizocephalus* with *M. helichrysoides* they may prove to contain disparate taxa. However, it would not surprise if this group, along with *M. appendiculatus* Benth., were eventually regarded as *Myriocephalus s. str.*

Wilson (1987) suggested that a group of species, i.e. *M. stuartii*, *M. morrisonianus* Diels (conspecific with *Helipterum craspedioides* W. Fitzg.) and *M. guerinae* should be referred to *Polycalymma* F. Muell. & Sond. He noted that all had a similar inflorescence structure. Fruit of *H. craspedioides* have not been examined (MEL material on loan) but sections of *M. stuartii* and *M. guerinae* fruit were obtained (Figs 8e, 9, 12a, b). Both have fruit with a prominent carpopodium, a long silky indumentum of twin hairs, a layer of sclerenchyma in the pericarp, and two vascular bundles in the testa. However, there are major structural differences, including general size and shape, and the number of vascular bundles in the pericarp. There are four vascular bundles in the pericarp of fertile fruit of *M. guerinae* but only two occur in *M. stuartii*. [Paul Wilson (pers. comm., 1988) has recorded that only two vascular bundles occur in the unfertilized ovary of *M. guerinae*.] The most obvious difference pertains to two depressions occurring in the lower $\frac{1}{2}$–$\frac{2}{3}$ of the flat surface of the fruit of *M. guerinae*. In sectioned fruit, these regions are seen to consist of parenchyma and, presumably as a result of infiltration, are not seen as marked depressions (Fig. 12a). These regions lack the long trichomes which otherwise envelop the fruit. The major anatomical differences between the species does not support the inclusion of *M. guerinae* with *M. stuartii* in *Polycalymma*.

Pluchea Cass. (TS)

Fruit of only *P. tetranthera* have been examined. Cypselae are glabrous and have a prominent annular carpopodium. Transverse sections revealed a thin pericarp, which lacks a thick-walled layer of tissue, and contains two vascular bundles in the lateral/oblique position. It was difficult to distinguish testa from pericarp, and what was believed to be testa was highly stained with cellular detail being almost obscured. Vascular bundles were not observed in the testa and cells with thickened walls also seemed to be absent from this tissue.

Podolepis Labill. (TS, SEM)

Asteridea Lindley and *Podolepis* are the only inuloid genera in Australia which contain species with marginal ligulate florets. However, not all *Podolepis* species possess such florets, and despite statements to the contrary by Turner (1967) *Podolepis* is clearly an unnatural genus. Members of the genus are only loosely grouped together by virtue of their scarious bracts and the usually conspicuous outer florets of the capitulum. Close examination reveals an array of floret types (including capitula with bisexual florets only; or with ligulate, irregularly ligulate or bilabiate outer female florets as well as inner bisexual florets), bract morphologies, and habit differences. Various chromosome numbers ($n = 3, 7, 8, 9, 10, 11, 12$; Turner 1967; Henderson 1969) also occur. Variation in the morphology of both bracts and corolla suggest that *Siemssenia* Steetz [including *P. capillaris* (Steetz) Diels and *P. microcephala*] and *Panaetia* Cass. [probably comprising *Podolepis lessonii*, *P. muelleri* (Sonder) G. L. Davis, *P. davisiana* D. Cooke and *P. tepperi* (F. Muell.) D. Cooke] could be reinstated. Similarly both *P. georgii* and *P. kendallii* (F. Muell.) F. Muell. should be excluded from *Podolepis s. str.* Davis (1956) noted that both were atypical of the genus, and it has

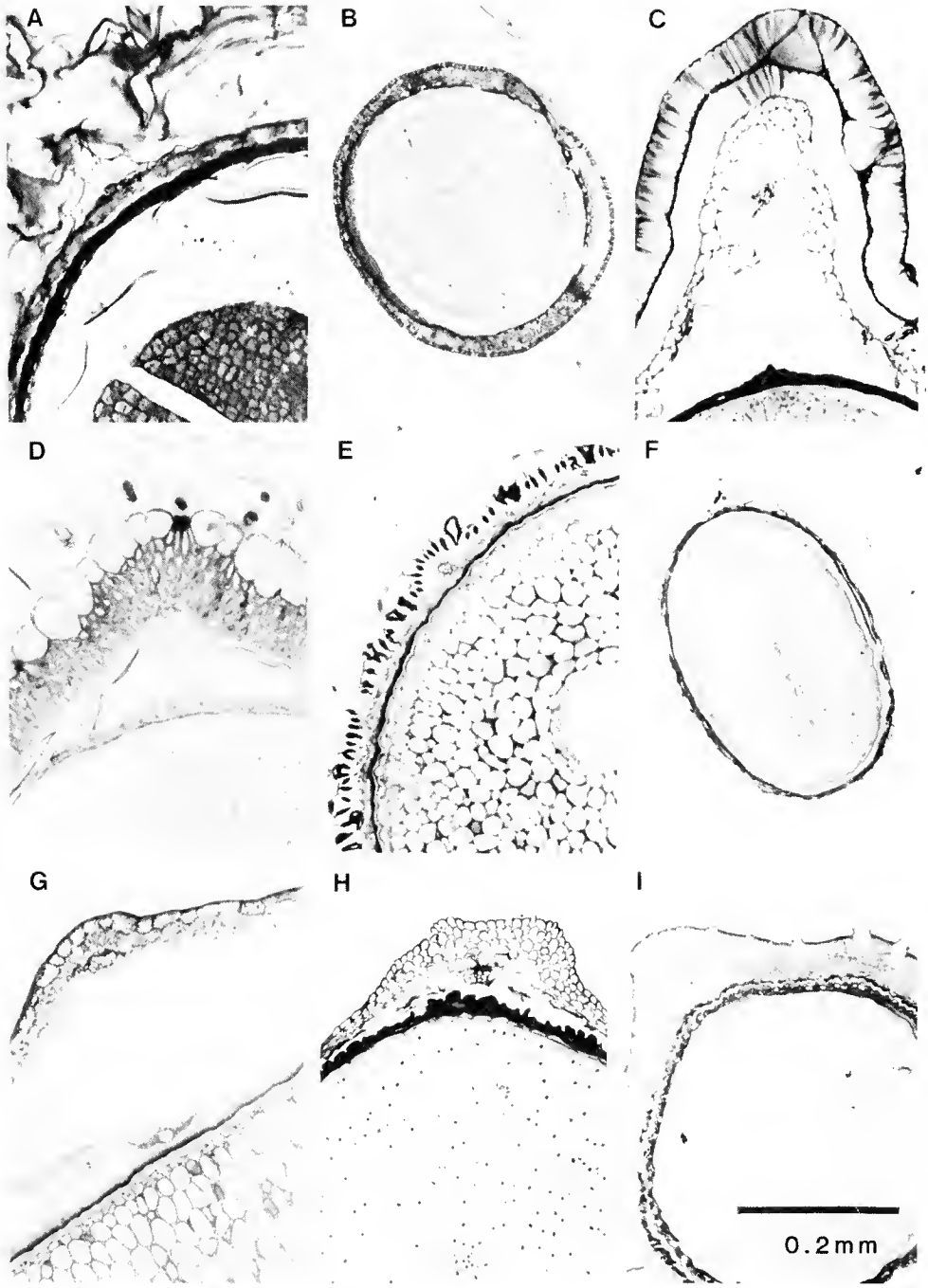

Fig. 11. Transverse sections of fruit. a — *Cephalosorus carpesioides* (*Short 2403*). b — *Gnephosis pygmaea* (*Short 2385*). c — *Helipterum albicans* subsp. *albicans* var. *buffaloensis* (*Short 1403*). d — *Helipterum charsleyae* (*Short 2003*). e — *Helipterum pygmaeum* (*Short 2973*). f — *Helichrysum apiculatum* (*Short 3027*). g — *Helichrysum cassinianum* (*Short 1575*). h — *Helichrysum leucopsideum* (*Short 1554*). i — *Ixiolaena chloroleuca* (*Short 3003*).

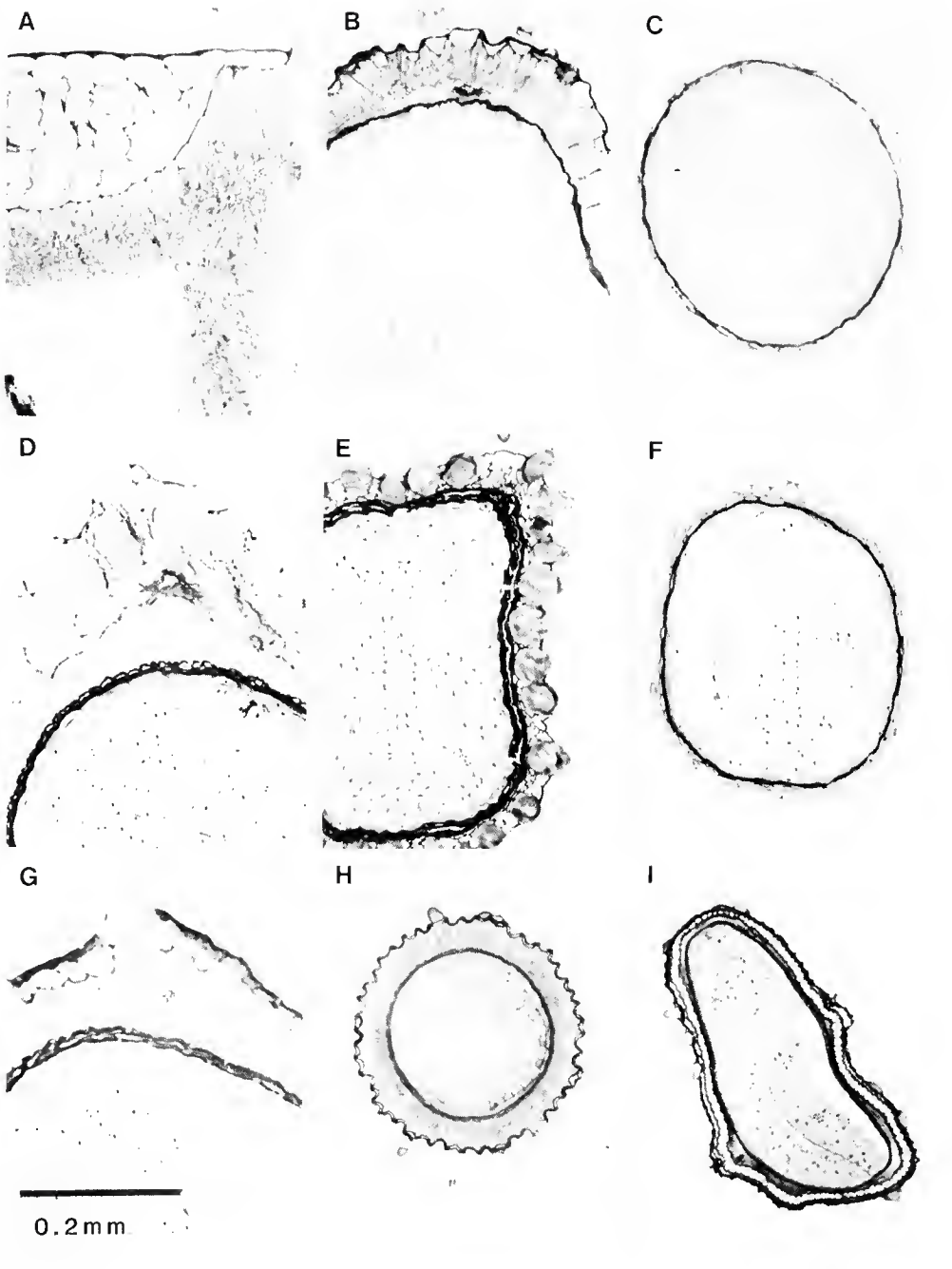

Fig. 12. Transverse sections of fruit. a — *Myriocephalus guerinae* (*Short 540*). b — *Myriocephalus stuartii* (*Czorney 1160*). c — *Pleuropappus phyllocalymmeus* (*Short 841*). d — *Podolepis arachnoidea* (*Willis s.n.*, MEL 1554024). e — *Podolepis gracilis* (*Willis s.n.*, MEL 611247). f — *Podolepis microcephala* (*Short 2050*). g — *Podolepis rugata* (*Short 1355*). h — *Toxanthes muelleri* (*Short 1251*). i — *Triptilodiscus pygmaeus* (*Short 3014*).

been noted that *P. georgi* is possibly conspecific with *Helichrysum ayersii* F. Muell. (Grieve & Blackall 1975).

Davis (*l.c.*, p. 249) stated that, with the exception of *P. kendallii* and *P. georgei*, in which the fruits are 'distinctive and diagnostic', the similarity in all other species 'is almost an occasion for comment'. Externally the pericarp of most species is somewhat similar, with the raised mucilage containing cells giving fruit a papillate appearance. A well developed carpopodium is also present in most, if not all, species. However, there are internal differences, the most obvious pertaining to the presence or absence of a layer of sclerenchyma in the pericarp, and the thickness of such layers when present. Of the ten species examined *P. gardneri*, *P. gracilis* (Figs 10d, 12e), *P. lessonii* and *P. microcephala* (Fig. 12f) all lack a layer of sclerenchyma whereas *P. arachnoidea* (Figs 10c, 12d), *P. auriculata*, *P. canescens*, *P. georgei*, *P. robusta* and *P. rugata* (Fig. 12g) possess one. The orientation of the vascular bundles in the pericarp varies from medial in *P. robusta* and *P. gardneri* to almost lateral in *P. rugata*. In other species examined the orientation is oblique. (Orientation of the vascular bundles could not be determined in *P. georgei* & *P. canescens*.) With the exception of *P. georgei* vascular bundles were not observed in the testa of any species. In the latter there are two bundles within the testa, with each one being opposite a vascular bundle in the pericarp.

Although incomplete, observation of the fruit structure of species of *Podolepis* support the notion that it is an unnatural genus and that *Siemssenia* and *Panaetia* should be reinstated.

RUTIDOSIS DC. (TS)

Transverse sections of fruit of only a single species, *R. helichrysoides*, the type of the genus have been obtained (Fig. 10a). This species has an external layer of sclerenchyma in the pericarp, the layer being usually two, but sometimes three or four cells wide. Two vascular bundles (their position not determined) occur in the pericarp, but bundles were not observed in the testa. Little cell detail could be discerned in a narrow, highly stained testa but thick-walled cells seemed to be absent. Externally the cypselae are covered with two-celled papillae which have their bases in the sclerenchymatous tissue. There is a prominent carpopodium.

The species of *Rutidosis* display an array of vegetative and inflorescence characters which suggest that the genus is heterogeneous. Haegi (1986) retained *R. multiflora* (Nees) Robinson in *Rutidosis* but indicated that were it not for the similar fruit it would have been excluded. Fruit of the former species and *R. helichrysoides* are similar in that both are obliquely attached to the corolla tube but an apparent absence of a carpopodium has been noted in *R. multiflora*. If a carpopodium is present then it is extremely small and concealed by basal papillae. The presence or absence of a carpopodium is frequently indicative of different genera, thus supporting the contention that *R. multiflora* should be excluded from *Rutidosis*.

TRIPTILODISCUS Turcz. (TS)

For many years *Triptilodiscus* has been included in *Helipterum* DC. The single species, *T. pygmaeus* [syn. *H. australe* (A. Gray) Druce], is readily distinguished from species of *Helipterum* by a number of features of the inflorescence and the reinstatement of the genus by Haegi (1986) is generally accepted. The fruit has two medial vascular bundles in the pericarp but, in TS, bundles were not observed in the testa. Paul Wilson (pers. comm. 1988) has recorded a single bundle in the testa. The pronounced thickening of the outer walls of the testa (Fig. 12i) in this species has not been observed in species currently included in *Helipterum*.

ACKNOWLEDGEMENTS

This work was funded by Australian Biological Resources Study grants to PSS from 1982 to 1987. We thank Ms R. McFarlane, Mr T. Dewan and Mr A. J. Spies for technical assistance and Dr D. B. Foreman, Mr J. Bruhl and Mr Paul G. Wilson for constructive criticism of the manuscript. Mr J. Bruhl and Dr C. J. Humphries kindly helped with the interpretation of fruit structure in the early stages of the survey.

APPENDIX

Species and voucher specimens from which fruit sections were obtained. All collections gathered by P. S. Short unless otherwise indicated.

Genus and species	Collection
ACTINOBOLE A. Gray	
A. condensatum (A. Gray) P. Short	*1005*
A. drummondiana P. Short	*2032*
A. oldfieldiana P. Short	*2013*
A. uliginosum (A. Gray) H. Eichler	*940*
ANGIANTHUS	
A. acrohyalinus Morrison	*2045*
A. brachypappus F. Muell.	*Barker s.n.*, MEL 594984
A. conocephalus (J. Black) P. Short	*Batt s.n.*, MEL 84412
A. cunninghamii (DC. Benth.	*Oldfield s.n.*, MEL 84418
A. drummondii (Turcz.) Benth.	*1102*
A. glabratus P. Short	*838*
A. aff. *micropodioides* (Benth.) Benth.	*Haegi 2664*
A. milnei Benth.	*2089*
A. aff. *milnei*	*1012*
A. preissianus (Steetz) Benth.	*842*
A. tomentosus Wendl.	*845*
CEPHALOSORUS A. Gray	
C. carpesioides (Turcz.) P. Short	*2403*
CHONDROPYXIS D. Cooke	
C. halophila D. Cooke	*Haegi 2565*
CRASPEDIA Forst. f.	
C. aff. *pleiocephala* F. Muell.	*837*
C. uniflora Forst. f.	*853*
DITHYROSTEGIA A. Gray	
D. amplexicaulis A. Gray	*2398*
EPITRICHE Turcz.	
E. demissus (A. Gray) P. Short	*2391*
FITZWILLIA P. Short	
F. axilliflorus (W.V. Fitzg. ex Ewart & J. White) P. Short	*2188*
GNEPHOSIS Cass.	
G. pygmaea (A. Gray) Benth.	*2385*
HELICHRYSUM Miller	
H. apiculatum (Labill.) D. Don	*3027*
H. bracteatum (Vent.) Andrews	*3022*
H. cassinianum Gaudich.	*1575*
H. leucopsideum DC.	*1554*
HELIPTERUM DC.	
H. albicans (A. Cunn.) DC. subsp. *albicans* var. *buffaloensis* P.G. Wilson	*1403*
H. charsleyae F. Muell.	*2003*
H. chlorocephalum (Turcz.) Benth.	*1746*
H. floribundum DC.	*3025*
H. maryonii S. Moore	*2644*
H. microglossum (F. Muell. ex Benth.) Maiden & Betche	*2992*
H. moschatum (Cunn. ex DC.) Benth.	*2985*
H. pygmaeum (DC.) Benth.	*2973*
H. strictum (Lindley) Benth.	*1581*
H. stuartianum Sonder & F. Muell. ex Sonder	*2982*
H. uniflorum J. Black	*3002*
HYALOCHLAMYS	
H. globifera A. Gray	*1040*
IXIOLAENA Benth.	
I. brevicompta F. Muell.	*3018*
I. chloroleuca Haegi	*3003*
I. leptolepis (DC.) Benth.	*2990*
I. tomentosa Sonder & F. Muell. ex Sond.	*2988*
LEMOORIA P. Short	
L. bukittii (Benth.) P. Short	*1761*
LEPTORHYNCHOS Less.	
L. tetrachaetus (Schldl.) J. Black	*3015*
MILLOTIA Cass.	
M. myosotidifolia (Benth.) Steetz	*2128B*
M. tenuifolia Cass.	*1753*
MYRIOCEPHALUS Benth.	
M. gracilis (A. Gray) Benth.	*1018*
M. guerinae F. Muell.	*540*
M. nudus A. Gray	*1004/1569*
M. stuartii (Sonder) Benth.	*Czorney 1160*
PLUCHEA Cass.	
P. tetranthera F. Muell.	*3008*
PLEUROPAPPUS F. Muell.	
P. phyllocalymmeus F. Muell.	*841*
PODOLEPIS Labill.	
P. arachnoidea (Hook.) Druce	*Willis s.n.*, MEL 1554024
P. auriculata DC.	*2033*
P. canescens Cunn. ex DC.	*2142*
P. gardneri G. L. Davis	*Smith 66/494*
P. georgei Diels	*Nelson 1754*
P. gracilis (Lehm.) Grah.	*Willis s.n.*, MEL 611247
P. lessonii (Cass.) Benth.	*2404*
P. microcephala Benth.	*2060*
P. robusta (Maiden & Betche) J. H. Willis	*Forbes 252*
P. rugata Labill.	*1355*
POGONOLEPIS Steetz	
P. muelleriana (Sonder) P. Short	*843*
P. stricta Steetz	*2086*
RUTIDOSIS DC.	
R. helichrysoides DC.	*2999*
SCYPHOCORONIS A. Gray	
S. incurva D. Cooke	*2001*
TOXANTHES Turcz.	
T. muelleri (Sonder) Benth.	*1251*
T. sp. aff. *muelleri*	*2353*
TRIPTILODISCUS Turcz.	
T. pygmaeus Turcz.	*3014*

REFERENCES

Bentham, G. (1837). *Ixiolaena. In* Endlicher, S. L., Bentham, G., Fenzl, E. & Schott, H., 'Enumeratio plantarum quas in Novae Hollandiae ora austro-occidentali ad fluvium cygnorum et in sinu Regis Georgii collegit Carolus Liber Baro de Hugel'. (Fr Beck.) p. 66.

Bentham, G. (1867). 'Flora Australiensis', vol. 3. (Reeve: London.) Compositae, pp. 447–680.

Beuzenberg, E. J. & Hair, J. B. (1984). Contributions to a chromosome atlas of the New Zealand flora — 27 Compositae. *New Zealand J. Bot.* 22: 353–356.

Bruhl, J. J. (1984). 'Intergeneric relationships in the Cotuleae (Anthemideae: Compositae)'. B.Sc.(Hons) thesis, University of New South Wales.

Bruhl, J. J. & Quinn, C. J. (1988). Cypsela anatomy in the 'Cotuleae' (Asteraceae, Anthemideae). *Bot. J. Linn. Soc.* (in press)

Cooke, D. A. (1986). Anthemideae. *In* Jessop, J. P. & Toelken, H. R. (eds), 'Flora of South Australia', part 3. (Government Printer: Adelaide.) pp. 1605–1623.

Davis, G. L. (1956). Revision of the genus *Podolepis* Labill. *Proc. Linn. Soc. N.S.W.* 81: 245–286.

Grieve, B. J. & Blackall, W. E. (1975). 'How to know Western Australian Wildflowers', part 4. (University of Western Australia Press.) Compositae, pp. 767–861.

Haegi, L. (1986). *Helichrysum, Ixiolaena, Leptorhynchos, Rutidosis, Triptilodiscus. In* Jessop, J. P. & Toelken, H. R. (eds), 'Flora of South Australia', part 3. (Government Printer: Adelaide.) pp. 1523–1538, 1550–1553, 1555–1559, 1576–1578, 1583–1584.

Haque, M. Z. & Godward, M. B. E. (1984). New records of the carpopodium in Compositae and its taxonomic use. *Bot. J. Linn. Soc.* 89: 321–340.

Henderson, R. J. F. (1969). *Podolepis monticola*, a new species of Compositae from Queensland. *Contr. Qd. Herb.* 2: 1–9.

Moore, S. L. M. (1903). Alabasta diversa. Part X. New plants from Australia. II. *J. Bot.* 41: 98–101.

Schodde, R. (1963). A taxonomic revision of the genus *Millotia* Cassini (Compositae). *Trans. Roy. Soc. S. Aust.* 87: 209–241.

Short, P. S. (1981). 'Biosystematic studies in Australian Gnaphaliinae (Compositae: Inuleae)'. Ph.D. thesis, Flinders University of South Australia.

Short, P. S. (1983). A revision of *Angianthus* Wendl., sensu lato (Compositae: Inuleae: Gnaphaliinae). *Muelleria* 5: 143–214.

Short, P. S. (1985). A revision of *Actinobole* Fenzl ex Endl. (Compositae: Inuleae: Gnaphaliinae). *Muelleria* 6: 9–22.

Short, P. S. (1986a). A revision of *Pogonolepis* Steetz (Compositae: Inuleae: Gnaphaliinae). *Muelleria* 6: 237–253.

Short, P. S. (1986b). *In* Love, A. (ed.). Chromosome number report XCII. *Taxon* 35: 610.

Short, P. S. (1987). A revision of *Blennospora* A. Gray (Compositae: Inuleae: Gnaphaliinae). *Muelleria* 6: 349–358.

Short, P. S. (1989a). A revision of *Podotheca* Cass. (Asteraceae: Inuleae: Gnaphaliinae). *Muelleria* 7: 39–56.

Short, P. S. (1989b). New genera and species of Australian Inuleae (Asteraceae) *Muelleria* 7: 103–116.

Steetz, J. (1845). *Schoenia. In* Lehmann, J. G. C. (ed.), 'Plantae Preissianae', vol. 1. (Hamburg). pp. 480–481.

Turner, B. L. (1967). Chromosome survey of *Podolepis* (Compositae–Inuleae). *Aust. J. Bot.* 15: 445–449.

Wilcox, B. H. (1977). 'A systematic study of the *Leucanthemum–Chrysanthemum* complex in North Africa' Ph.D. thesis, University of Reading.

Wilson, P. G. (1960). A consideration of the species previously included within *Helipterum albicans* (A. Cunn.) DC. *Trans. Roy. Soc. S. Aust.* 83: 163–177.

Wilson, P. G. (1987). *Quinqueremulus linearis*, a new genus and species in the Australian Asteraceae (tribe Inuleae). *Nuytsia* 6: 1–5.

Manuscript received 30 March 1988

TWO NEW SPECIES OF *POMADERRIS* Labill. (RHAMNACEAE) FROM SOUTH-EASTERN AUSTRALIA

by

NEVILLE G. WALSH*

ABSTRACT

Walsh, Neville G. Two new species of *Pomaderris* Labill. (Rhamnaceae) from south-eastern Australia. *Muelleria* 7(1): 81–87 (1988). — *Pomaderris gilmourii* from New South Wales and *P. humilis* from Victoria are described as new species and notes on distribution, ecology and their relationship to other members of the genus are provided. Two varieties of *P. gilmourii* are recognised.

INTRODUCTION

The genus *Pomaderris* contains a number of species which are morphologically ill-defined and nomenclaturally confused. In the course of the preparation of a general revision of the genus, a number of apparently clearly defined, undescribed taxa have been encountered. As sufficient data pertaining to these taxa are gathered which confirm their distinctness, they will be described in order that reference to them is facilitated more quickly than would be the case if their publication were delayed until a generic revision is completed.

This is the second recent paper describing new species in Pomaderris. See also *Muelleria* 6: 6 (1988).

TAXONOMY

Pomaderris gilmourii N. G. Walsh, sp. nov.

Frutex ad 4 m altum. *Ramuli* glabrescentes. *Folia* obovata, oblanceolata vel anguste elliptica, 8–30 mm (raro ad 40 mm) longa, 4–13 mm lata, apice acuto ad obtusum vel rotundato, pinnatinervia, nervorum 3–5 pares, supra glabra vel pubescentia secus costae, infra tomentosa trichomatibus stellatis. *Stipulae* subulatae ad 4 mm longas, caducae. *Inflorescentiae* terminales, laxe paniculatae, pyramidales vel rotundatae, 2–5 cm diametro, aliquantum abundans. *Flores* apetala, pedicellis 1–4 mm longis. *Sepala* oblonga, apice acuto, pagina externa pilis brevis argenteis, interne glabra. Filamenta staminum 1–1·5 mm longa. *Antherae* oblongae vel ellipticae, 0·5–1 mm longae. *Stylus c.* 1 mm longus, trilobus, divisus basi fere.

TYPUS: New South Wales — South Coast, Deua National Park, Prominence 1·9 km north from Coondella trig. point, *c.* 16 km WSW. from Moruya, 35° 55′ 50″ S., 149° 54′ 20″ E. Alt. 480 m, 7.xii.1987, *N.G. Walsh 1889* (HOLOTYPUS: MEL 1557601. ISOTYPI: BRI, CBG, HO, NSW).

Shrub to 4 m high. *Branchlets* glabrescent, but covered when young by semi-appressed to appressed simple hairs or tufted trichomes, with or without an underlying hoary layer. *Petiole* 2–8 mm long. *Lamina* obovate, oblanceolate or narrowly elliptic, 8–30 (rarely to 40) mm long, 4–13 mm wide; apex acute to obtuse or rounded; penninerved with 3–5 pairs of lateral veins which are inconspicuous above; upper surface glabrous or with a line of short hairs above the midvein; lower surface densely covered with fine stellate trichomes, with or without a superficial layer of appressed, shining simple hairs. *Stipules* subulate, to 4 mm long, soon deciduous. *Inflorescences* loosely paniculate, pyramidal or rounded, mostly 2–5 cm diam., terminal on the main axis and short lateral branches and rather prolific. Pedicels 1–4 mm long. Sepals oblong, acute at apex, covered with short silver-grey hairs externally, glabrous and cream-coloured on the inner face. *Petals* absent. *Stamens* alternating with sepals; filament 1–1·5 mm long; anther *c.* 0·5–1 mm long. *Ovary*

*National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

inferior, trilocular, the summit densely covered by erect simple hairs. *Style c.* 1 mm long, divided almost to the base into 3 spreading arms. *Capsules* not seen.

Although the species is known from only a few collections, specimens can be readily segregated into two entities. These are here described as varieties although future collections of the species may indicate that a reassessment of the taxonomic rank of the two entities is warranted.

Key to the Varieties of Pomaderris gilmourii

1. Indumentum of leaf undersurfaces, petioles, branchlets etc. with a dense superficial layer of appressed simple hairs, imparting a shining appearance to those surfaces; leaf margins thickened and glabrous, apparent as a distinct border on undersurface. Sepals *c.* 1·5 mm long ..... var. *gilmourii*
1. Indumentum not including a dense superficial layer or appressed simple hairs, surfaces appearing dull; leaf margins neither thickened or glabrous, not apparent as a border on either surface. Sepals *c.* 1 mm long .....var. *cana*

P. gilmourii N. G. Walsh var. **gilmourii**

Folia incrassata margine vel recurvata, supra glabrum omnino, infra cum pilis adpressis sericeis nitentibus. *Sepala c.* 1·5 mm longa. *Antherae* oblongae *c.* 1 mm longae. *Stylus* sparsim pubescens infra divisuram.

Leaves with margins thickened or minutely recurved, appearing bordered from beneath; undersurface with fine stellate trichomes overlain by appressed, shining, silky, simple hairs; upper surface quite glabrous. *Sepals c.* 1·5 mm long. *Anthers* oblong *c.* 1 mm long. *Style* sparsely pubescent below point of division, glabrous above. (Fig. 1, a–d).

Other Specimens Examined (Total examined, 7):

New South Wales — South Coast: Deua National Park, *c.* 6km N. of 'Bendethra', 35° 54′ S., 149° 43′ E. Alt. 700 m, 28.iii.1985, *P. Gilmour 4988* (MEL 681685 and 671106, Dupl. CBG 8505373). South Coast: Deua National Park, *c.* 2km N. of Coondella trig., 35° 56′ S., 149° 54′ E. Alt. 450 m, 25.xi.1985, *P. Gilmour 5333* (MEL 681668, Dupl. CBG 8505382). Deua National Park, near Mt Donovan, AMG 8826-624291. Alt. 540 m, 28.iii.1985, *P. Beesley 376 & D. Binns* (MEL 672076). From type locality, 7.xii.1987, *N.G. Walsh 1877* and *1890* (MEL 1557604 and 1557609 respectively).

P. gilmourii var. **cana** N. G. Walsh var. nov.

Folia plano margine, supra pubescentia secus costae. Sepala *c.* 1 mm longa. *Antherae* ellipticae, *c.* 0·5 mm longae. *Stylus* pubescens ultra divisuram.

Typus: New South Wales — South Coast, Deua National Park. Prominence 1·9 km north from Coondella trig. point, *c.* 16 km WSW. from Moruya, 35° 55′ 50″ S., 149° 54′ 20″ E. Alt. 480 m, 7.xii.1987, *N.G. Walsh 1876* (Holotypus: MEL 1557595. Isotypi: BRI, CBG, HO, K, NSW).

Leaves with plane margins, not appearing bordered from beneath; tomentum of lower surface of stellate trichomes only, or if a few simple hairs present, then these neither appressed nor shining; upper surface minutely pubescent above the midvein. *Sepals c.* 1 mm long. *Anthers* elliptic *c.* 0·5 mm long. *Style* pubescent beyond the point of division. (Fig. 1, e–g).

Other Specimens Examined (Total examined, 2):

New South Wales — South Coast: Deua National Park, *c.* 2 km N. of Coondella trig., 35° 56′ S., 149° 54′ E. Alt. 450 m, 25.xi.1985, *P. Gilmour 5327* (MEL 684706, 681669, Dupl. CBG 8505378).

Distribution and Conservation Status:

P. gilmourii var. *gilmourii* is currently known only from Deua National Park and its immediate environs, within an area of only about 15 km diameter. The land system supporting *P. gilmourii* is poorly known however and further populations may be

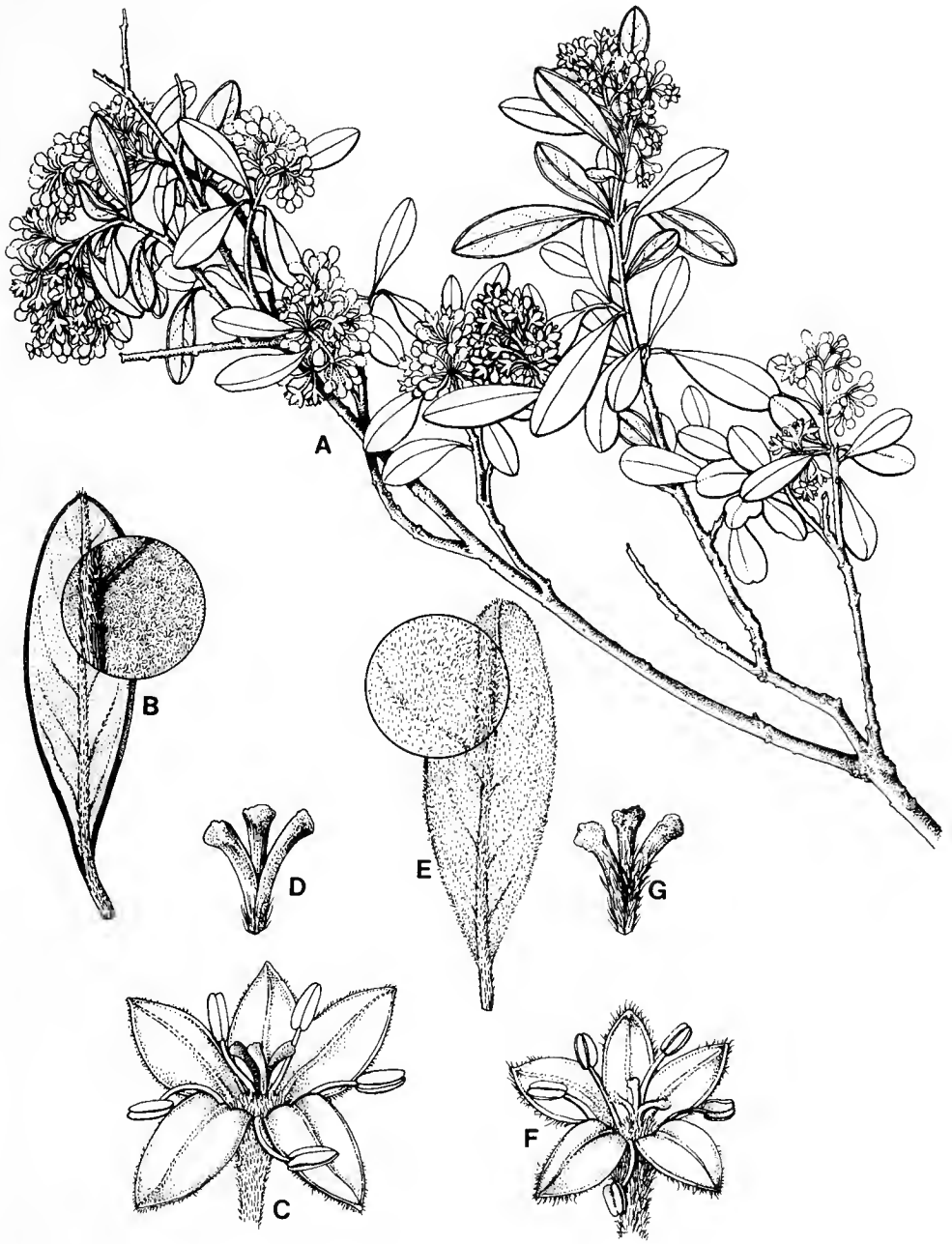

Fig. 1. *Pomaderris gilmourii* var. *gilmourii*. a — branchlet in bud and flower, ×1. b — undersurface of leaf ×3; inset ×9. c — flower ×8. d — style ×12. *P. gilmourii* var. *cana*. e — undersurface of leaf ×3; inset ×9. f — flower ×8. g — style ×12. a–d drawn from *N.G. Walsh 1889* (type); e–g drawn from *N.G. Walsh 1876* (type).

expected to be discovered in the course of detailed survey of the general area. *P. gilmourii* var. *cana* is known only from a few plants at the type locality where it occurs with the typical variety. The species conservation status has been assessed as 2RC-t (Briggs & Leigh 1988), that is the species is rare ('R'), represented within a conservation reserve ('C'), the population size is unknown ('–'), but all known plants are reserved ('t').

HABITAT:

P. gilmourii occurs on skeletal soils derived from rhyolite, an igneous rock, in this area formed as part of the Comerong Volcanic series (Gilligan 1974). Most sites are exposed, on or atop steeply sloping rock faces supporting shrubland or open woodland, although one collection (*Gilmour 4988*) is apparently from a more sheltered site supporting open forest. Recorded altitudes range from 450 m to 700 m. Associated species typically include a number of similarly localised, rhyolite-endemic species such as the recently described *Prostanthera porcata*, *Westringia saxicola* and an undescribed *Leptospermum* as well as other species characteristic of clifftop shrubland and woodland communities, e.g. *Eriostemon trachyphyllus*, *Platysace lanceolata*, *Hakea dactyloides*, *H. macreana*, *Kunzea ambigua* and *Eucalyptus stenostoma.*

NOTES:

P. gilmorii is a very distinctive species unlikely to be confused with any other *Pomaderris* in the eastern states. However, sterile specimens somewhat resemble *P. myrtilloides*, a species of calcareous, mostly coastal sites in southern Western Australia and it was to this species which I very hesitantly referred the first (sterile) material of *P. gilmourii* I saw. Unlike *P. gilmourii* though, the western species is not apetalous and has a style which is barely cleft. The indumentum of *P. gilmourii* var. *gilmourii* is suggestive of that of *P. ledifolia*, a species also typically associated with exposed, rocky peaks, but the characteristic very narrow leaves and crowded, petalous flowers of that species readily distinguish it from *P. gilmourii*. *P. cinerea*, a species endemic to the south coast region of New South Wales and which also occurs within Deua National Park shares with *P. gilmourii* a number of features which may indicate a closer relationship than the general appearance of the two species suggests. Both species flower later in the year than any other *Pomaderris* in the broad area, both are apetalous and perhaps most significantly, both species have a pubescent style, a feature not known from other members of the genus. The general nature of the indumentum of *P. cinerea* and its overall dusky appearance are reflected to some extent in *P. gilmourii* var. *cana.*

The specific epithet honours Mr Phil. Gilmour, formerly of Canberra, who first collected this species and whose collections comprise the majority of herbarium specimens of it. His botanical surveys of the largely unexplored south coast area of New South Wales in general and the rugged and largely inaccessible rhyolite country in particular, have unearthed a number of new species and improved our knowledge of many rare and restricted plants.

The varietal epithet *cana* refers to the dull, greyish appearance of that variety, in contrast to the brighter overall aspect of the typical variety.

Pomaderris humilis N. G. Walsh, sp. nov.

Frutex decumbens vel infirme ascendens, plerumque ad 0·5 m altum. *Ramuli* stellato-tomentosi cum pilis simplicibus vel trichomatibus caespitosis longioribus. *Folia* elliptica vel ovata raro obovata, 10–50 mm longa, 7–25 mm lata, apice rotundato versus late acutum, pinnatinervia, nervorum 5–7 pares, supra pilosa cum pilis simplicibus suberectis raro cum stellatis vel bifidis trichomatibus paucibus, *c.* 0·2 mm longis, infra stellato-tomentosa cum pilis simplicibus longioribus praesertim in costis et nervis. *Stipulae* lanceolatae, ad 4 mm longas, caducae. *Inflorescentia* terminales, paniculatae, pyramidales plerumque 3–5 cm diametro. *Sepala* oblonga, 2–2·5 mm longa, apice acuto, pagina externa stellato-tomentosa cum pilis simplicibus longioribus, interne glabra. *Petala* spathulata, breviora parum sepalis, margine apicali irregulatim crenato. *Filamenta* staminum 2–2·5 mm longa. *Antherae* oblongae, *c.* 1 mm longae. *Stylus* 1·5–2 mm longus, integer fere vel divisus $\frac{1}{3}$ parte sui longitudinis. *Capsulae* ovoideae, *c.* 3·5×2·5 mm.

TYPUS: Victoria — Gippsland, Holey Plains State Park, Holey Hill, beside 'Banksia Forest' walk, 0·3 km WNW. from fire tower on summit, 14 km south-east from Rosedale, 38° 13′ S., 146° 57′ E. Alt. *c.* 170 m, 1.x.1986, *N.G. Walsh 1616* (HOLOTYPUS: MEL 1556333. ISOTYPI: CANB, HO).

Decumbent or weakly ascending shrub, mostly to *c.* 0·5 m high, rarely to 1·6 m high. *Branchlets* and petioles closely stellate-tomentose with an overlying layer of longer, simple hairs or tufted trichomes. *Lamina* elliptic or ovate, rarely obovate, 10–50 mm long, 7–25 mm wide; apex rounded to broadly acute; penninerved with 5–7 pairs of lateral veins; upper surface pilose with erect or slightly antrorsely inclined simple hairs *c.* 0·2 mm long, rarely also with a few bifid or stellate trichomes; lower surface pale, with a dense mat of minute stellate trichomes and some longer (*c.* 0·5 mm) simple hairs, those of the midrib and lateral veins longer (to 1 mm) and more numerous. *Stipules* lanceolate, to 5 mm long, soon deciduous. *Inflorescences* paniculate, pyramidal, mostly 3–5 cm diam., terminal. *Pedicels* 2–3 mm long. *Sepals* spreading, oblong, 2–2·5 mm long, acute at apex, covered externally with a dense stellate tomentum with longer simple hairs, these dense on the thalamus tube; inner face creamy yellow, glabrous. *Petals* erect, pale yellow, spathulate, slightly shorter than sepals, the apical margin irregularly crenate. Stamens opposite the petals; filament 2–2·5 mm long; anther oblong, *c.* 1 mm long. *Ovary* inferior, trilocular, the summit densely covered by erect hairs. *Style* 1·5–2 mm long, almost entire or divided in the upper one-third into three spreading arms. *Capsules* ovoid, *c.* 3·5 × 2·5 mm. *Seeds* elliptic, dorsally rounded, *c.* 2·5 × 1·5 mm. (Fig. 2).

OTHER SPECIMENS EXAMINED (Total examined, 6):

Victoria — from type locality: 2.ix.1949, *J.D. Sherwood s.n.* (MEL 55064); 6.iii.1973, *A.C. Beauglehole 41615* (MEL 517247, Dupl. NSW); 28.ix.1974, *J.H. Willis s.n.* (MEL 91867); 14.vi.1986, *N.G. Walsh 1602* (MEL 1549453, Dupl. NSW, HO); Gippsland, Rosedale, Cheshum Rd, *c.* 8 miles south of town, off Limepit Rd, 18.x.1969, *B. Thompson s.n.* (MEL 504689).

DISTRIBUTION AND CONSERVATION STATUS:

Known with certainty only from the type area, the population there consisting of an estimated 2000–5000 plants. A specimen in early bud [*Beauglehole 37541* (MEL 517249, Dupl. NSW)] from near Bruthen (*c.* 100 km ENE. from the type locality), may be *P. humilis* but the buds are insufficiently developed for a confident assignation of the specimen. Surveys of the area during the 1986 and 1987 flowering seasons failed to locate plants matching the Beauglehole (37541) specimen. Both the Bruthen site and Holey Hill are formed on late Tertiary marine sediments (Geological Survey of Victoria 1971, 1977). Local edaphic and general conditions in the two areas are very similar and the two sites have many species in common.

The conservation status of *P. humilis* has been assessed as 2RCat (Briggs & Leigh 1988), that is the species is rare, represented in a conservation reserve, the population exceeds 1000 individuals (a) and the total population occurs in a conservation reserve. A number of plants of *P. humilis* at the northern fringe of the population were apparently removed in the early 1970s in a clearing operation to make way for a *Pinus radiata* plantation (Mrs B. Thompson, South Traralgon, pers. comm.).

HABITAT:

P. humilis occurs on coarse, sandy soil derived from late Tertiary marine deposits. The vegetation type is a *Eucalyptus consideniana–E. globoidea* open forest with a tall shrub layer dominated by *Banksia serrata* and a heathy low shrub and ground layer including *Brachyloma daphnoides*, *Monotoca scoparia*, *Banksia marginata*, *Grevillea chrysophaea* and *Lepidosperma concavum*.

NOTES:

Pomaderris humilis has in the past (e.g. Beauglehole 1980) been referred to *P.* aff. *velutina*. It bears a superficial resemblance to *P. velutina* J. H. Willis in the somewhat velvety upper surfaces of the leaves, but the hairs on the upper surfaces of the leaves of

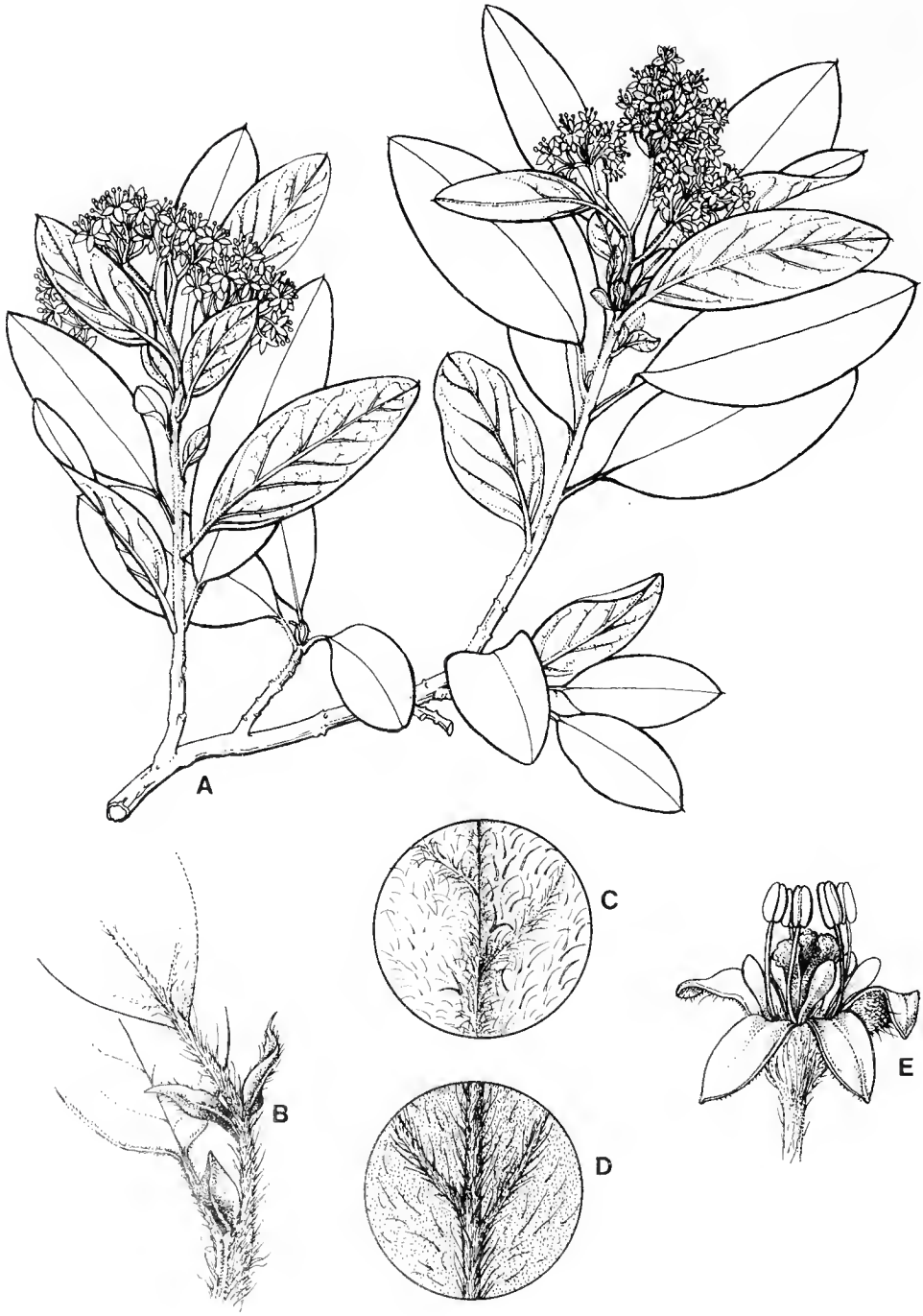

Fig. 2. *Pomaderris humilis*. a — flowering branchlet ×1. b — stipules and leaf base ×4. c — upper surface of leaf ×10. d — lower surface of leaf ×10; flower ×6. a, c, d and e drawn from the holotype; b drawn from *Beauglehole 41615* (MEL 517247).

P. humilis differ in being predominantly simple and substantially longer and sparser. Furthermore *P. velutina* has few, thread-like simple hairs confined to the midrib and larger veins on the undersurfaces of the leaves and flowers with relatively broad petals and deeply trifid styles, whereas *P. humilis* has copious simple hairs on both the veins and internerves of the lower leaf surface, and flowers with narrow petals and shallowly cleft styles.

P. humilis is probably more closely allied to *P. aurea* Wakefield and the widespread *P. lanigera* (Andrews) Sims. From the former it differs conspicuously in the simple pubescence of the upper leaf surface and narrow petals and from *P. lanigera* in the finer tomentum on the upper surface of the leaves, the sparser, less spreading pubescence beneath, the narrow petals, shallowly cleft style and the relatively small, pyramidal inflorescence (*P. lanigera* characteristically has a broad, hemispherical or flat-topped inflorescence).

From virtually all eastern state *Pomaderris* species, *P. humilis* is distinguished by its largely decumbent growth habit, whence the specific epithet is derived. This growth habit has been maintained in cultivated plants growing in East Malvern (Victoria) for more than two years. Occasional wild-growing plants occurring amongst dense vegetation may attain 1·6 m in height but this growth is usually rather spindly. The growth habit of the plant near Bruthen from which *Beauglehole 37541* was collected is unknown.

P. humilis is the taxon referred to as '*Pomaderris* sp. (Holey Hill)' in Forbes and Ross (1988).

ACKNOWLEDGEMENTS

I wish to thank Mr Phil Gilmour for his efforts in procuring specimens of *P. gilmourii* on my behalf; Jan, Kate and Rick Walsh for their cheerful company in the field; Mrs Bon Thompson of Traralgon South for information pertaining to *P. humilis*; and my colleague, Miss Anita Podwyszynski who prepared the illustrations.

REFERENCES

Beauglehole, A. C. (1980). 'Victorian Vascular Plant Checklists'. (Western Victorian Field Naturalists Clubs Association: Portland.)

Briggs, J. D. & Leigh, J. H. (1988). Rare or threatened Australian plants: The 1988 revised edition. Austral. Natl Parkes & Wildlife Serv. Special Publ. 14.

Forbes, S. J. & Ross, J. H. (1988). 'A census of the vascular plants of Victoria. Second edition'. (National Herbarium of Victoria: Melbourne.)

Geological Survey of Victoria (1971 and 1977). Australia 1:250,000 geological map series, Warragul and Bairnsdale, sheets SJ55-10 and SJ55-7 respectively. (Govt. Printer: Melbourne.)

Gilligan, L. B. (1974). Canberra 1:250,000 metallogenic map. SI-55-16. Geol. Surv. N.S.W., Sydney.

Manuscript received 13 May 1988

A NEW SUBSPECIES OF *GREVILLEA ACANTHIFOLIA* (PROTEACEAE:GREVILLEOIDEAE) FROM SOUTH-EASTERN NEW SOUTH WALES

by

R. O. MAKINSON* and D. E. ALBRECHT†

ABSTRACT

Makinson, R. O. & Albrecht, D. E. A new subspecies of *Grevillea acanthifolia* A. Cunn. (Proteaceae: Grevilleoideae) from south-eastern New South Wales. *Muelleria* 7(1): 89–93 (1989). — A new subspecies of *Grevillea acanthifolia* spp. *paludosa* R. Makinson & D. Albrecht, from the Nalbaugh Pleateau is described and illustrated, with notes on distribution and habitat, and a key to subspecies of *G. acanthifolia*.

INTRODUCTION

Material collected by P. Gilmour and D. Albrecht on the Nalbaugh Plateau in February 1987 was found to be closely related to *G. acanthifolia*, ssp. *acanthifolia* and to *G. acanthifolia* ssp. *stenomera* (F. Muell. ex Benth.) McGillivray, which occur respectively in the Central and Northern Tablelands of New South Wales, and shares features with each that make subspecific rank appropriate.

Terminology and presentation follows that used by D. J. McGillivray in his revision of *Grevillea* (in prep.).

TAXONOMY

Grevillea acanthifolia A. Cunn. ssp. **paludosa** R. Makinson et D. Albrecht, ssp. nov.

a *Grevillea acanthifolia* A. Cunn. subsp. *acanthifolia* lobis foliorum angustioribus et inflorescentiis brevioribus, a *G. acanthifolia* ssp. *stenomera* (F. Muell. ex Benth.) McGillivray ramulis subsericeis et statura excelsiore, ab ambosus subspeciebus pilis adpressis plerumque praesentibus infra laminarum foliorum affinibus costae et donatoribus pollinis conicis validus et erectis plus differt. (Fig. 1).

TYPUS: *c.* 2·5 km WNW. of Mt Wog Wog trig., Nalbaugh National Park, 37° 05′ 15″ S., 149° 24′ E., rare (12 plants seen) in peaty drainage line. Shrub *c.* 3 m high and 5 m diameter. Associated spp. include *Boronia deanei*, *Gahnia radula*, *Leptospermum lanigerum*, *Tetrarrhena acuminata*, *Schoenus maschalinus*, *Gleichenia dicarpa*, *Bauera rubioides*, *Acacia costiniana*, 22.ii.1987, *D.E. Albrecht 3078 & P. Gilmour* (bud, fl., fr.). (HOLOTYPUS: MEL 1556925; ISOTYPUS: NSW).

Prickly spreading shrub to 3 m high and 5 m wide, with ascending to decumbent branches and entangled foliage. *Branchlets* angular in cross-section, longitudinally ridged, subsericeous (sometimes the ridges almost glabrous). *Leaves* subsessile (appearing petiolate — laminal tissue below basal lobe-pair very narrow), deeply pinnatipartite, (35–)40–60 mm long, 40–70 mm wide (when pressed flat), with 5–9 divaricate primary lobes, primary lobes usually 3–7-partite; secondary lobes divaricate, usually entire or occasionally bipartite; ultimate lobes subulate to sublinear, (10–)12–18(–20) mm long, 1·5–2·5 mm wide, rigid, acute, cuspidate with a pungent point 1–2 mm long; margin refracted, usually some undersurface of lamina visible on either side of the midribs of leaf and lobes; upper surface glabrous; lower surface subsericeous to glabrous on either side of the midribs; midribs glabrous or with scattered more or less appressed hairs; texture coriaceous. *Inflorescences* terminal, profuse, conspicuous, erect, pedunculate, simple, many-flowered, secund, acropetal, 30–50 mm long; peduncles 5–10 mm long, tomentose; peduncle and rhachis subvillous with very pale spreading hairs, hairs darker and more appressed below the

*National Herbarium of New South Wales, Mrs Macquaries Road, Sydney, NSW, Australia 2000.
†National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

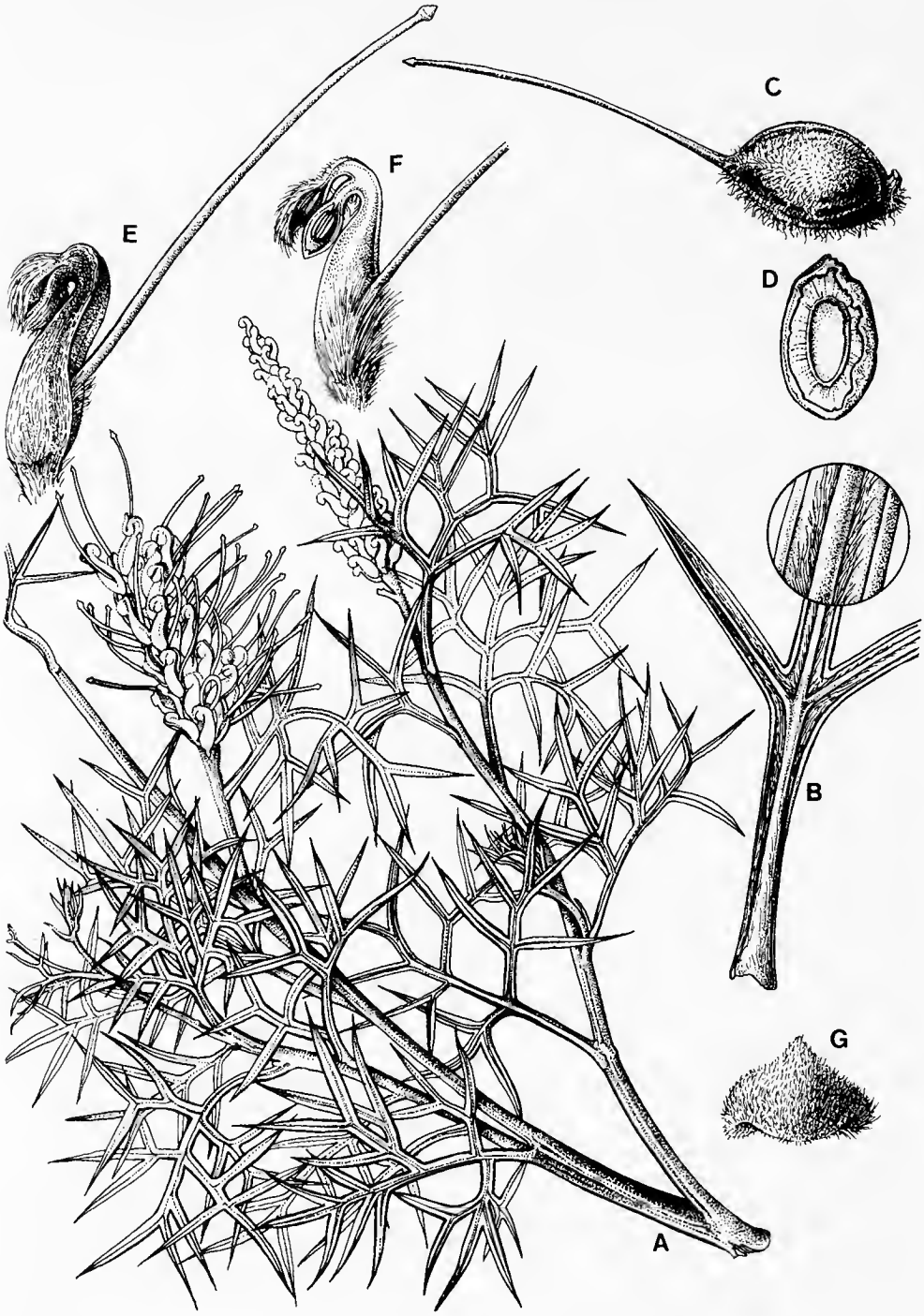

Fig. 1. *Grevillea acanthifolia* ssp. *paludosa*. a — Flowering branch, ×0·8. b — Undersurface of leaf, ×2 and (inset) showing distribution of hairs. c — Mature fruit, ×2·5. d — Inner face of mature seed, ×4. e — Mature flower, ×3·5. f — Section through mature flower, ×3·5. g — Floral bract, ×5. Drawn from holotype, (*D.E. Albrecht 3078 and P. Gilmour*).

lowermost peduncular bract or bract scar; floral bracts broadly ovate, apiculate, 2–3·5 mm long, 2·5–4·5 mm wide, outer surface tomentose, inner surface glabrous except for few to many ascending hairs along the midline or towards the apex, bracts conspicuous on young inflorescences, usually deciduous when buds are *c.* 6–10 mm long. *Pedicels* 1·0–1·5 mm long, villous; torus oblique at *c.* 15°–25° to the transverse, 1·2–1·5 mm from ventral to dorsal side. *Perianth* narrowly and obliquely ovoid below the subapical curve, outer surface subsericeous to tomentose below the curve, villous on the ellipsoid limb, inner surface glabrous; nectary U-shaped, partly enclosed within the torus, pistil 21–24 mm long; stipe 0·5–1·2 mm long, subsericeous; ovary 1·2–1·6 mm long, villous; style glabrous; pollen-presenter a more or less erect cone with a basal rim, ± ovate or round in plan view, 0·8–1·0 mm long and wide, base oblique at *c.* 10°–20° to the transverse, cone 0·8–1·0 mm high. *Fruit* a follicle, appressed to the rhachis by inward curving of the stipe, obliquely ellipsoid, 8·5–10·5 mm long, *c.* 6–7·5 mm wide, *c.* 5–6 mm thick; style persistent; surface villous-velutinous, with a short dense indumentum of stout erect hairs, indumentum with purplish longitudinal stripes and blotches (formed by hairs with dark cell contents), and an emergent loose indumentum of longer pale spreading hairs; pericarp *c.* 0·3–0·4 mm thick, weakly crustaceous. *Seeds* (*Albrecht 3078*) obliquely ellipsoid, 6–7 mm long, *c.* 3·5 mm wide, 1·5–2 mm thick; outer face convex, somewhat rugose; inner face with a peripheral ridge of waxy material, and an inner ridge of harder tissue surrounding a central elliptical area *c.* 2·5–3·5 mm long and 1–1·5 mm wide; apical elaiosome subtriangular, *c.* 1 mm long, of waxy material similar to and connecting with the peripheral ridge on the inner face. *Buds* with limb blue-grey, overlain with cream hairs; tepals below the limb cream-green in early bud, becoming blue-grey near (and after) anthesis. *Ovary* covered with white hairs. *Style* (emergent from dorsal side of perianth in late bud) rich puce-pink in bud, paling slightly at and after anthesis. *Style-end* and pollen-presenter green.

Distribution and Conservation Status:

G. acanthifolia ssp. *paludosa* is known by only 41 plants in two drainage lines on Nalbaugh Plateau (which extends from Mt Wog Wog to White Rock Mountain), *c.* 45 km inland from Eden, south-east New South Wales. Nalbaugh Plateau is situated within Nalbaugh National Park, hence all known individuals are secured within a biological reserve. Figure 2 shows the locations of populations seen on the plateau.

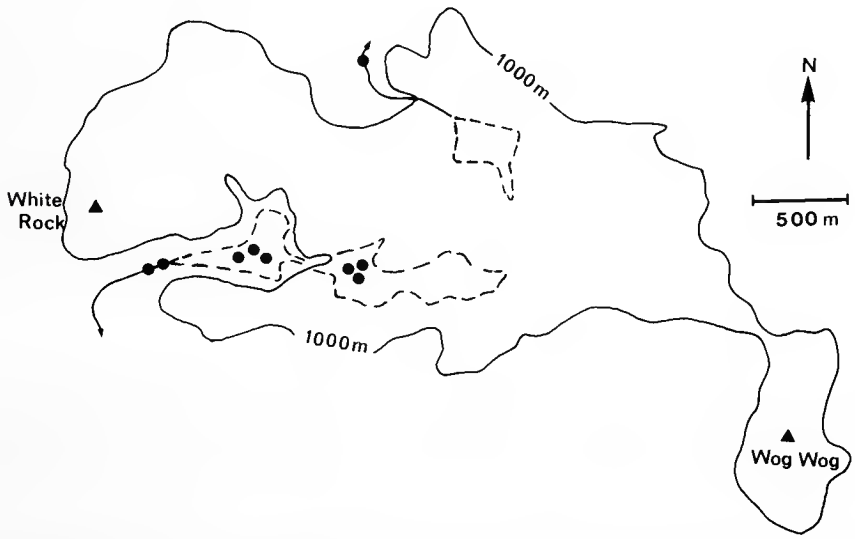

Fig. 2. Occurrences of *G. acanthifolia* ssp. *paludosa* on Nalbaugh Plateau (•); – – – – swamp boundaries.

Ecological Notes:

Most plants (34 of the 41 known individuals) were found in a structurally and floristically heterogeneous swamp community in the headwaters of the White Rock River catchment at an elevation of 975–1005 m. The swamp system is underlain by Nalbaugh granite and has a distinctive microtopography consisting of peat and Sphagnum, with flat depressions; occasional shallow pools; emergent better drained and densely vegetated hummocks, and occasional runnels of quartzitic gravel. Depth of the surface layer of peat at one population was 50 cm. Plants of *G. acanthifolia* ssp. *paludosa* appeared to be restricted to the hummocks, which were shared with and surrounded by, *Leptospermum scoparium*, *Gahnia sieberiana*, *Boronia deanei*, *Sprengelia incarnata*, *Gleichenia dicarpa*, *Pultenaea subumbellata* and *Bauera rubioides*. The height of the community ranged from one to three metres and is surrounded by a dense *Leptospermum lanigerum* dominated scrub to *c.* 10 m high.

Most of the remaining few plants were growing in dense *Leptospermum lanigerum* thickets that fringe the free-flowing creek downstream from the swamps. The substrate in these localities differed in being rocky and gravelly with loam pockets. Two isolated plants were seen in similar streamside vegetation on the separate Wog Wog River catchment; the swamp upstream of this at present lacks any plants despite its close similarities to the White Rock River swamps.

The age structure of populations was relatively uniform. Judging from the stem diameter and size of plants (the smallest seen was 2 m high and *c.* 1·5 m diameter), most plants appear to be quite old. Although most plants appeared to have set a considerable amount of seed, no seedlings were observed.

Like other closely related taxa, *G. acanthifolia* ssp. *paludosa* is probably fire sensitive and principally regenerates from seed. It may however have the potential to resprout as occasional post fire resprouting from the base of the stem has been observed in populations of *G. acanthifolia* ssp. *acanthifolia* in swamps of the Lithgow area (D. H. Benson, pers. comm.).

The introduced honey bee (*Apis mellifera*) and two species of honeyeater (the White-eared Honeyeater and the New Holland Honeyeater) were seen feeding on the flowers of the *Grevillea*.

Key to the Subspecies of G. acanthifolia

1. Ultimate leaf lobes linear or subulate; most of undersurface of leaf enclosed by refracted margin; inflorescences usually ≤5 cm long.
   2. Undersurface of leaves and lobes glabrous except for scattered appressed hairs on the midribs; branchlets glabrous or occasionally loosely tomentose; stipe ≥1·5 mm long; pollen-presenter oblique, broadly conical; low spreading shrub usually ≤1 m high ..... ssp. *stenomera*
   2. Undersurface of some or all leaves and lobes with white appressed hairs on the lamina either side of the midrib; branchlets subsericeous (ridges sometimes glabrous); stipe <1·5 mm long; pollen-presenter an erect cone; erect spreading shrub attaining 3 m in height ..... ssp. *paludosa*
1. Ultimate leaf lobes cuneate or ovate, rarely linear; most of undersurface of leaf lobes exposed, margin recurved; inflorescences usually >5 cm long ..... ssp. *acanthifolia*

Affinities

This new subspecies closely resembles in leaf division and lobe shape ssp. *stenomera* from the eastern part of the New England area of New South Wales, but the latter is a less hairy shrub and does not appear to much exceed 1·5 m in height.

The erect, strongly conical pollen-presenter of ssp. *paludosa* is not shared with either ssp. *stenomera* or ssp. *acanthifolia*, which usually have oblique, broadly conical to convex pollen-presenters, although occasional flowers of the latter subspecies have pollen-presenters oblique at as little as *c.* 10°–15° (more usually 20°–30°). The basal rim or 'brim' of the pollen-presenter in ssp. *paludosa* is somewhat oblique (to 20°) but the axis of the cone in relation to the upper few millimetres of the style is quite erect.

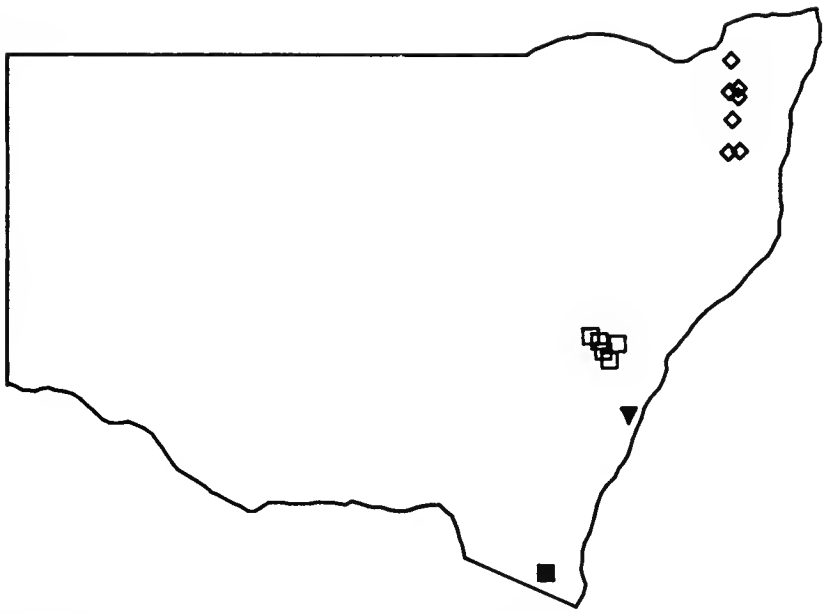

Fig. 3. Distribution of *G. acanthifolia* subsp. *paludosa* and some related taxa in New South Wales. *G. acanthifolia* ssp. *acanthifolia* □, *G. acanthifolia* ssp. *stenomera* ◇, *G. acanthifolia* ssp. *paludosa* ■, *G. rivularis* ▼.

Like ssp. *paludosa*, the other two subspecies of *G. acanthifolia* are also usually found in swampy heath communities, although ssp. *stenomera* is occasionally found on drier woodland slopes.

In habit and leaf shape, ssp. *paludosa* is strongly reminiscent of the closely related *G. rivularis* L. Johnson & McGillivray which also grows 'with its feet wet', in the flood zone of a creek near Fitzroy Falls on the N.S.W. Central Tablelands. *G. rivularis* is however an almost glabrous plant.

Figure 3 shows the distribution of ssp. *paludosa* in relation to these closely related taxa. The great geographic separation of these taxa implies a long term separation of the original stock and subsequent divergence to the present taxa. It is interesting to speculate why ssp. *paludosa* occurs where it does and why it is so rare. Although the Nalbaugh peat deposits may not span the last ice age (P. Gell, pers. comm.), analysis of the pollen profiles of cores extracted from the Nalbaugh swamps may provide some additional informative data on fire history of the plateau and relative changes in the abundance of ssp. *paludosa* over the last few thousand years.

FURTHER SPECIMEN SEEN:

New South Wales: Southern Tablelands — Plateau between Mt Wog Wog and White Rock Mountain, 'Long Swamp', catchment of White Rock River, 8.xi.1987, *R.O. Makinson 322* (bud-fl.) (NSW, BRI, CANB, CBG, MEL, NE).

ACKNOWLEDGEMENTS

We wish to thank Mr Don McGillivray for comments on the specimens; Mr P. Gilmour and Mr W. M. (Bill) Molyneux for assistance with field work; Mr D. H. Benson, Mr N. G. Walsh and Mrs K. L. Wilson for comments on the manuscript; Miss A. M. Podwyszyinski for the illustration; and Mr N. G. Walsh for the Latin diagnosis.

Manuscript received 14 June 1988

A NEW SPECIES OF *TETRARRHENA* R. Br. (POACEAE) FROM VICTORIA AND NEW SOUTH WALES

by

NEVILLE G. WALSH*

ABSTRACT

Walsh, Neville G. A new species of *Tetrarrhena* R. Br. (Poaceae) from Victoria and New South Wales. *Muelleria* 7(1): 95–98 (1989). — *Tetrarrhena turfosa* is described as a new species with notes on distribution and ecology. Its relationship to other members of the genus is discussed.

INTRODUCTION

In the course of preparing the account of Poaceae for a forthcoming Flora of Victoria, several apparently unnamed taxa have been encountered. The majority of these are in groups currently under study by others and should, in due course, be dealt with by them. The species described herein has long been recognised as being distinct but has evaded formal recognition. As it seems no specialists are presently dealing with *Tetrarrhena*, the opportunity is here taken to validate the status of a sixth member of the genus.

TAXONOMY

Tetrarrhena turfosa N. G. Walsh, sp. nov.

Gramen perenne, rhizomatosum, caespitosum vel ascendens, 0·2–1·3 m altum. *Folia* erecta, laevia et glabra. *Vaginae* amplexicaules. *Ligulae* ciliatae, ad 0·5 mm longae. *Laminae* involutae, 2–7 cm longae, 0·3–0·8 mm latae, obtusae interdum inflatae apicibus. *Inflorescentia* racemosa, angusta, erecta, spicam simulans, 1–3 cm longa. *Spiculae* 3–10, subsessiles, saepe purpuratae, 4·8–6·8 mm longae. *Glumae* subaequales, ovatae, 1–2 mm longae. *Lemma* sterilis infernum longitudine circa $\frac{2}{3}$ partes lemmatis sterilis superni, ambo oblongae, obtusae, carinatae vix, nervi 5–7 ellevati manifeste, scabri. *Lemma* fertilis aequans fere lemma sterilem supernum, carinatum, scaberulum. *Palea* aequans fere lemma sterilem. *Antherae* quatuor, circa 3 mm longae.

TYPUS: Victoria — Western. Grid D 18. Grampians, 3 miles (6·4 km) SW. of Halls Gap, 0·15 miles (0·24 km) west of junction with Mt Rosea Track, along watercourse. Associated species include: *Pultenaea subumbellata*, *Sprengelia*, *Selaginella*, *Restio complanatus*, *Lepidosperma* spp. *Gymnoschoenus*, *Gahnia sieberiana*, 18.i.1969, *Beauglehole 30309* (HOLOTYPUS: MEL 597060. ISOTYPI: AD, BRI, CANB, HO, NSW).

A rhizomatous, perennial grass, forming compact tufts, commonly to *c.* 0·6 m high in exposed sites, or with leafy, branched, ascending strands to 1·3 m high amongst taller vegetation. *Leaves* erect, smooth and glabrous. *Sheaths* tightly encircling stem. *Lamina* tightly involute, 2–7 cm long, 0·3–0·8 mm diameter, terminating in a blunt, sometimes slightly swollen tip. *Ligule* a ciliate rim to 0·5 mm long, sometimes with a few marginal hairs to 1 mm long. *Inflorescence* an erect, spike-like raceme 1–3 cm long. *Spikelets* 3–10 per raceme, 4·8–6·8 mm long, subsessile, often purplish. *Glumes* subequal, the upper usually slightly larger, ovate, 1·1–2 mm long, smooth and glabrous. *Lower sterile lemma* about $\frac{2}{3}$ as long as upper, both oblong, blunt, hardly keeled, the 5–7 nerves prominently raised and scabrid. *Fertile lemma* almost equal to upper sterile lemma, keeled, uniformly scaberulous, obscurely 5–7 nerved. *Palea* about as long as lower lemma, membranous. *Anthers* 4, about 3 mm long. (Fig. 1).

SELECTED SPECIMENS EXAMINED (Total number examined 43):

New South Wales — Barrington Tops, swamps and grasslands, 7.i.1934, *Vickery* (NSW 115676).

*National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

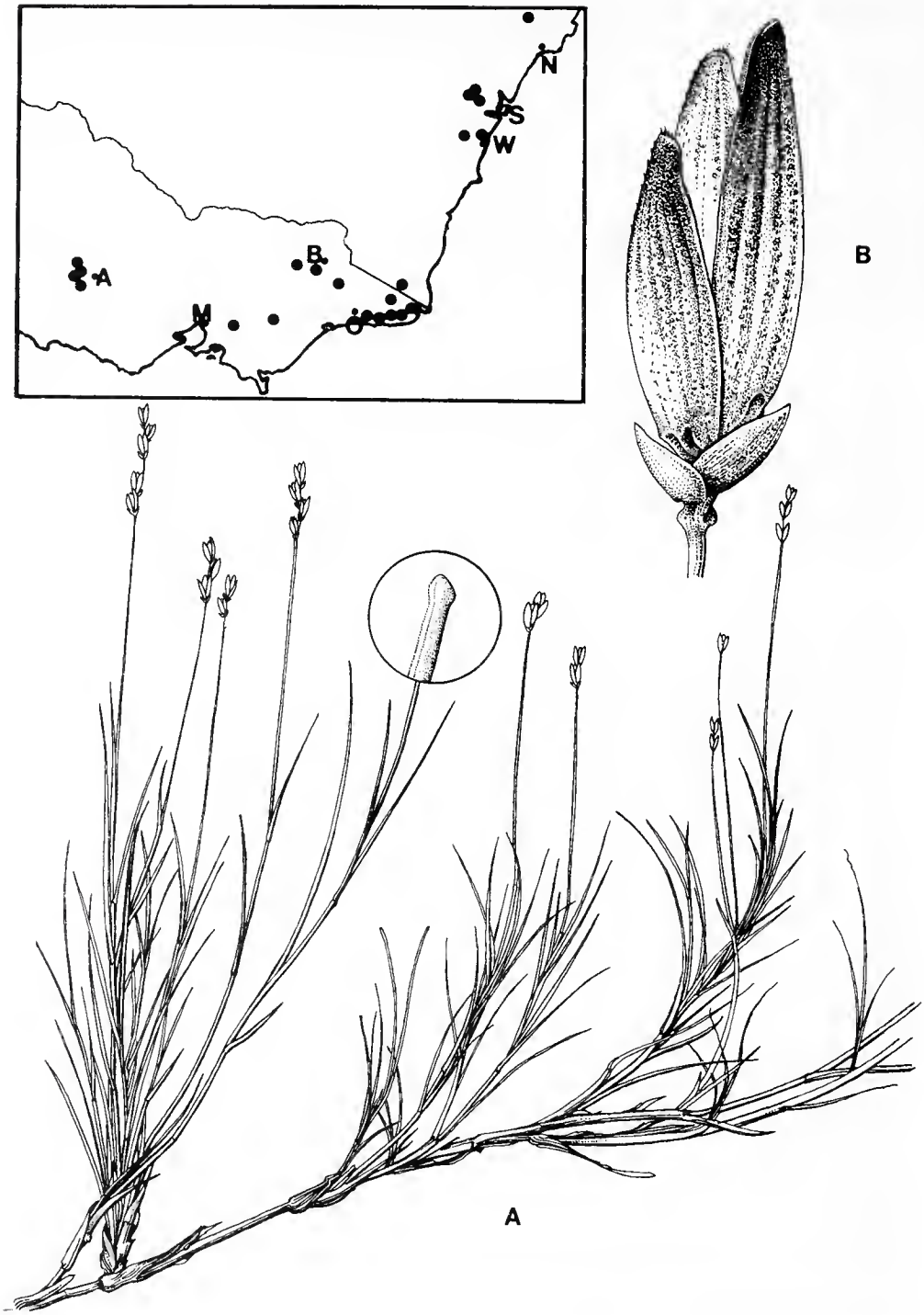

Fig. 1. *Tetrarrhena turfosa*. a — habit, ×½; inset — leaf tip ×5. b — spikelet ×10, from Beauglehole 30309 (type). Inset — distribution of *T. turfosa* (n.b. each dot may represent more than one collection); places represented are A = Ararat, M = Melbourne, B = Mt. Bogong, O = Orbost, W = Wollongong, S = Sydney, N = Newcastle.

Centennial Park, vi.1897, *Camfield s.n.* (NSW 115689). Katoomba, swampy places, alt. 3100 ft, 22.i.1939, *Blake 13920* (NSW 115671). Bridal Veil Falls, Blackheath, alt. 3450 ft, *Constable s.n.* (NSW 56320). 1·5 miles N. of Hilltop near Mittagong, 6.ii.1965, *McBarron 10538* (NSW 115680).

Victoria — Mt Buffalo, Crystal Brook, near 'Tucker Box' corner, 21.ii.1963, *Willis s.n.* (MEL 113885). Bogong High Plains, 20.i.1940, *Patton s.n.* (MEL 597061). Nunniong Plateau, *c.* 0·5 ml. SW. of Reedy River Chasm, 3.ii.1973, *Beauglehole 41349* (MEL 527466). Mallacota–Wingan coast, 0·9 ml. NE. of Little River Mouth, 22.xii.1969, *Beauglehole 32695* (MEL 564478). Erica district, beside Beynons Road, *c.* 3 km south of Morgans Mill, 10.i.1980, *Scarlett 80-3* (MEL 596706).

DISTRIBUTION AND CONSERVATION STATUS (Fig. 1):

Occurs mostly on and seaward from the Dividing Range from as far north as the Barrington Tops area in New South Wales south to the Victorian border and west to The Grampians in south-western Victoria. The species is locally common in appropriate habitats, although some populations (e.g. near Mt Wog Wog in south-eastern NSW, and subalpine to subalpine sites in Victoria) are disjunct and would appear to be quite small. Fortunately the species is well reserved in national parks in both states and its conservation status is therefore considered to be secure.

ECOLOGY:

The grass is invariably associated with heathy and sedge-rich vegetation in swamps and fringing watercourses from near sea-level in eastern Victoria to subalpine situations (to *c.* 1650 m) in both states. Soils are typically sodden and peaty, chiefly derived from or formed upon sandstone, but on Mt Buffalo and the Bogong High Plains the parent materials are granite and basalt respectively. Commonly associated plants are typified by those species accompanying the type collection, i.e. with strong representation of the Epacridaceae, Cyperaceae, Restionaceae and, particularly at higher altitudes, *Sphagnum* mosses. The main flowering and fruiting period is from November to February.

NOTES:

T. turfosa is the taxon first recorded as an apparently undescribed species by Willis (1970) and subsequently by Beauglehole (1980) and Forbes and Ross (1988) as *Tetrarrhena* sp. It would appear to be most closely allied to *T. acuminata* R. Br. (near which it occasionally occurs) and the recently described *T. oreophila* D. I. Morris of Tasmanian alps and subalps to which it bears a strong superficial resemblance. From *T. acuminata*, it differs primarily in the shorter (<7 mm) spikelets, the obtuse, not acuminate sterile lemmas and the smooth, inrolled, not scabrous or flat leaf blades.

From *T. oreophila* it is distinguished by the obtuse, strongly scabrous and prominently 5–7 nerved sterile lemmas, in contrast to those of the Tasmanian endemic which are acute to acuminate, minutely scaberulous or almost smooth and lacking prominent nerves.

Material of *T. turfosa* at NSW had been segregated as an ecological variant of *T. juncea* R. Br. Examination of the types from BM and K (including the type of *T. tenacissima*, a later synonym), and all specimens of *T. juncea* at MEL and NSW confirms that there is no continuity of variation from that species to *T. turfosa*. *T. juncea*, a forest species, is infamous for its harshly scabrous, leaves and wiry stems and differs otherwise from *T. turfosa* in its relatively longer glumes, and more tapered, virtually smooth lemmas. Both *T. juncea* and *T. oreophila* are atypical in the genus (and belie the feature on which the generic name is conferred) in possessing 6 and 2 (or 1) anthers respectively rather than the 'typical' tetrandrous condition.

The two other species of *Tetrarrhena* are *T. laevis* R. Br., confined to the south-west of Western Australia and *T. distichophylla* R. Br., which typically has pubescent spikelets and leaves and is a species of poor, dryish country in southern Victoria, south-eastern South Australia and Tasmania.

The specific epithet '*turfosa*' (from a peat bog) pertains to the species well-defined preference of habitat.

ACKNOWLEDGEMENTS

I am grateful to the Curators of BM and K for the loan of type material, to the Director and staff of NSW for assistance during a visit to that institution, to my colleague Mr David Albrecht who examined collections of *Tetrarrhena* at HO, and Miss Anita Podwyszynski who prepared the illustration.

REFERENCES

Beauglehole, A. C. (1980). 'Victorian Vascular Plant Checklists'. (Western Victorian Field Naturalists Clubs Association: Portland.)

Brown, R. (1810). Prodromus Florae Novae Hollandiae. (Taylor: London.)

Forbes, S. J. & Ross, J. H. (1988). 'A census of the vascular plants of Victoria. Second edition'. (National Herbarium of Victoria: Melbourne.)

Morris, D. I. (1977). Miscellaneous notes on endemic Tasmanian plants. *Records of the Queen Victoria Museum* 55: 3–5.

Willis, J. H. (1971). 'A handbook to plants in Victoria. Volume 1. Ferns, Conifers and Monocotyledons'. (Melbourne University Press: Carlton.)

Manuscript received 21 June 1988

FERDINAND MUELLER, GOVERNMENT BOTANIST: THE ROLE OF WILLIAM HOOKER IN HIS APPOINTMENT

by

HELEN M. COHN*

ABSTRACT

Cohn, Helen M. Ferdinand Mueller, Government Botanist: the role of William Hooker in his appointment. *Muelleria* 7(1): 99–102 (1989) — Contemporary commentary makes no mention of William Hooker being involved in Mueller's appointment as Government Botanist in Victoria. The only obituary that makes this claim is unreliable. Later writers offer no support for their contention that Hooker recommended Mueller for the post. Circumstances of Mueller's training, early emigration to Australia and botanical researches in Australia before settling in Victoria suggest that the possibilities for him to have established any connection with Hooker were too limited for Hooker to be in a position to recommend him. The Colonial Office disclaimed official knowledge of Mueller's appointment, an unlikely occurrence had Hooker been involved. Statements made by Mueller and Hooker themselves confirm that Hooker had no role in Mueller's appointment.

INTRODUCTION

It is generally believed that Ferdinand Mueller's appointment by Charles La Trobe to the position of Government Botanist to the Colony of Victoria in 1853 was at the recommendation of Sir William Hooker, then Director of the Royal Botanic Gardens, Kew . This would not have been unusual or unexpected given Hooker's position of influence with regard to the placement of suitably qualified people in colonial botanical posts. However, an examination of contemporary and later writings reveals little ground to support this contention. Similarly, the circumstances of Mueller's early career suggest that it was most unlikely that Hooker made any such recommendation.

BIOGRAPHICAL SOURCES

There are very few contemporary biographical notes about Mueller which shed any light on this question. Mueller was extremely reticent about himself, his letters and publications being confined almost exclusively to his work. It was left to other people to make public the details of his career. Among the earliest general biographical notes is that written by Joseph Knapp (1877). In it he states: 'In demselben Jahre [1852] folgte er dem Rufe des Gouverneurs C. Latrobe als Regierungs-Botaniker der Colonie Victoria in den Staatdienst . . .'. No mention is made here of any intercession on the part of William Hooker.

On Mueller's death in 1896 a large number of obituaries and memorial notices was published. These also are remarkably silent on the circumstances of Mueller's appointment. Baldwin Spencer, Professor of Biology at the University of Melbourne and like Mueller one of the leading figures in the still small world of Victorian science, wrote from personal acquaintance with Mueller (Spencer 1896). Spencer makes no mention of William Hooker but gives La Trobe all the credit: 'Evidently his reputation as a botanist had preceded him, for in the same year Governor Latrobe appointed him Government Botanist . . .'. Other memorialists, like Spencer, credit Mueller's appointment solely to La Trobe (Battye 1897; Warburg 1897), or make no mention of the underlying reasons (McOwan 1896; Anon. 1896).

*National Herbarium of Victora, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

The only obituary that attributes to William Hooker any role in Mueller's appointment is that written by William's son Joseph, his successor as Director at Kew (Hooker 1897). In it he says:

> Among his [Mueller's] English correspondents was Sir W. Hooker, who interested himself in his favour with Mr Goulburn, then on the point of leaving England as Lieutenant-Governor of Victoria, and who was desirous of having the vegetable resources of that colony turned to the best account. This resulted in the creation of a Department of Botany in the Public Service of Victoria, and the appointment of Mueller to its directorship.

No 'Mr Goulburn' occupied any senior position in the Victorian Civil Service at that time. It seems probable that Joseph Hooker was referring to Frederick Goulburn who came to the colonies as Colonial Secretary (not Lieutenant-Governor) to New South Wales (not Victoria) and died in 1837. There are other errors of fact in the obituary: Mueller is said to have arrived in Victoria from South Australia in 1848 (the actual date was 1852) expressly to visit the Victorian alps, and to have been one of the three founders of the Royal Society of Victoria. The Society came into being from the amalgamation of two earlier societies having between them a total of 21 founding members. In 1897 when he wrote this tribute to Mueller, Joseph Hooker was 80 years old, trusting to his memory to recall events of 45 years previously. Joseph Hooker cannot be considered a reliable witness to his father's role in Mueller's appointment.

Later biographers unequivocally state that William Hooker was involved in Mueller's appointment. Mueller was variously said to have been 'well accredited by the eminent botanist, Sir William Hooker' (Daley 1924: 26) and 'recommended' by him (Hardy 1945), and La Trobe to have been 'persuaded' by Hooker to appoint Mueller (Roach 1921). The two major biographies of Mueller claim that Hooker had 'spoken highly of the merits of Dr Ferdinand Mueller' (M. Willis 1949: 19), and that approval of the appointment lay with Hooker (Kynaston 1981: 80). Other writers have simply followed suit, for example J. Willis (1971) and Powell (1982). However not one of these writers offers any supporting evidence.

MUELLER IN EUROPE

It is highly unlikely that William Hooker knew very much about Mueller at the time of his appointment. Mueller left Germany at the age of 22, having just qualified and having had little if any time to establish a reputation for himself outside his own country. His outward journey to South Australia on the 'Herrmann von Beckerath' seems to have offered him no opportunity to meet either of the Hookers or any of the other leading botanical personalities in England, so that he was virtually unknown to the British botanical establishment. For the first five years of his time in Australia before settling in Victoria, the specimens and papers he sent back to Europe were to his German colleagues rather to anyone in England. This is reflected in the pattern of his early publications.

By the end of 1853 Mueller's European publications comprised eight papers in German scientific journals and only two in England (Churchill, Muir & Sinkora 1978 & 1984). Taking into account the length of time for mail to reach Europe and the vagaries of the editorial and publication process, publications in Europe or England in 1853 represent work done some time before that. In the absence of any scientific publishing outlet in the Australian colonies, Mueller had naturally turned to the contacts he had at home to assist with the publication of his scientific researches.

The two papers published in England were actually translations of papers published in Germany in the same year (Mueller 1853c & 1853d). They appeared in William Hooker's own *Journal of Botany and Kew Garden Miscellany* (Mueller 1853a & 1853b). However, they were not sent to Hooker. Rather they were sent to Richard Kippist, then Librarian to the Linnean Society of London, who translated them from German and read them to meetings of the Society on the 7th and 21st December 1852 respectively. Hooker had an unhappy history of publishing a succession of journals which struggled and finally collapsed under the weight of a small buying public,

dwindling copy and heavy production costs (Brock 1980). It is not hard to see why he would have seized the opportunity to print these two short papers in the fourth and last of his journals. What is clear from this is that Mueller at that point had no thought of relying on Hooker as he did on his German contacts.

Even had William Hooker been well acquainted with Mueller it is unlikely he would have recommended him ahead of a British botanist. Throughout his career at Kew Hooker was instrumental in placing British botanists in key botanical posts, all of which were official, all over the world. In this he took his 'right' of patronage very seriously. There is the celebrated case of Charles Moore, who was appointed to the Botanic Gardens in Sydney ahead of Hooker's own nominee and to Hooker's considerable disgust (Gilbert 1986). His influence in colonial botanical matters was well known. G. W. Francis at the Adelaide Botanic Gardens appealed to Hooker for support should rival claims be made for his job as Director there (Best 1986).

COLONIAL APPOINTMENT

Finally, had William Hooker recommended or approved Mueller's appointment the necessary correspondence would have passed through the Colonial Office in London. Minuted on a letter from Governor Hotham to the Colonial Office dated 31st January 1855 is the following revealing comment:

> I do not recall that Dr Mueller's name ever came officially before this Department before. He is here styled Government Botanist, and he certainly was appointed in the Colony. I recollect, however, Mr La Trobe mentioning Dr Mueller very favorably in a private letter. He would be able to furnish any information regarding Dr Mueller. (CO 309 v.31 204)

The most positive indication that William Hooker played no part in Mueller's appointment comes from Mueller himself. He introduced himself to Hooker in a letter dated 3rd February 1853, a mere seven days after being appointed Government Botanist. He had already embarked on the first of his exploring journeys through Victoria.

> As a highly esteemed promoter of botanical science throughout the world, you will, I trust, Sir William, not without some interest receive the intelligence, that his Excell. our scientific Governor Latrobe has been pleased to entrust to me the newly created office of a government botanist for this province, an appointment that I joyfully accept, as it now enables me at length to devote my time henceforth exclusively to the study of the indigenous plants . . . Of my botanical labours in South Australia, I suppose little came to your notice . . . (Kew Correspondence v.74, 135)

Hooker replied that he was 'most agreeably surprised' to have received the 'welcome intelligence' of his engagement by the government. 'This is exactly as it should be and I shall write to the Governor by this day's post to thank him for his service thus rendered to our favourite science' (Argus 31.10.1853 p. 5).

ACKNOWLEDGEMENTS

The letter from Mueller to William Hooker is quoted with permission from the Royal Botanic Gardens, Kew.

REFERENCES

Colonial Office series 309: inwards correspondence to the Secretary of State from Victoria.

Royal Botanic Gardens, Kew. Correspondence vol. 74: Australian letters 1851–58.

Anon. (1896). Baron von Mueller. *Gard. Chron.* 3s. 20: 464–466.

The Argus, Melbourne.

Battye, J. S. (1897). Memoirs of the late Baron von Mueller. *J. Proc. Mueller Bot. Soc. W. Austral.* 1(5): 5–12.

Best, B. J. (1986). *George William Francis, first Director of the Adelaide Botanic Garden.* (B. J. Best: Adelaide.)

Brock, W. H. (1980). The development of commercial science journals in Victorian Britain. *In* Meadows, A. J. (ed.), *Development of science publishing in Europe.* (Elsevier: Amsterdam.) pp. 95–122.

Churchill, D. M., Muir, T. B. & Sinkora, D. M. (1978). The published works of Ferdinand J. H. Mueller (1825–1896). *Muelleria* 4: 1–120.
Churchill, D. M., Muir, T. B. & Sinkora, D. M. (1984). The published works of Ferdinand J. H. Mueller (1825–1896). Supplement *Muelleria* 5: 229–248.
Daley, C. (1924). Baron Sir Ferdinand von Mueller, K.C.M.G., M.D., F.R.S., botanist, explorer and geographer. *Victorian Hist. Mag.* 10(1): 23–75.
Gilbert, L. A. (1986). *The Royal Botanic Gardens Sydney*. (Oxford University Press: Sydney.)
Hardy, A. D. (1945). Excerpts from letters of Baron Sir Ferdinand von Mueller. *Victorian Hist. Mag.* 21(1): 1–23.
Hooker, J. D. (1897). [Obituary]. *Proc. Roy. Soc. London 63:xxxii–xxxvi.*
Knapp, J. A. (1877). Baron Ferdinand von Mueller: eine biographische Skizze. *Z. Allg. Oesterr. Apotheker Vereines* 15(36): 597–617.
Kynaston, E. (1981). *A man on edge: a life of Baron Sir Ferdinand von Mueller.* (Allen Lane: Ringwood).
MacOwan, P. (1896). The late Baron Sir Ferdinand von Mueller, C.M.G., F.R.S., etc. *Agric. J. Cape of Good Hope* 9(24): 627–628.
Mueller, F. (1853a). The flora of South Australia, displayed in its fundamental features, and comparatively. *Hook. J. Bot. Kew Gard. Misc.* 5: 65–72.
Mueller, F. (1853b). The vegetation of the districts surrounding Lake Torrens. *Hook. J. Bot. Kew Gard. Misc.* 5: 105–109.
Mueller, F. (1853c). Südaustraliens Flora, in ihren Grundzügen und vergleichend dargestellt. *Hamburger Garten-Blumenzeitung* 9: 267–273.
Mueller, F. (1853d). Die Vegetation der Gegenden um den Torrens-See. *Hamburger Garten-Blumenzeitung* 9: 340–343.
Powell, J. M. (1982). National identity and the gifted immigrant Baron von Mueller, scientist and public servant, 1825–96. *Journal of Intercultural Studies* 3(1): 56–61.
Roach, B. S. (1921). Ferdinand von Mueller. *South Australian Naturalist* 2: 76–82.
Spencer, W. B. (1896). Baron von Mueller. *Victorian Naturalist* 13: 87–92.
Warburg, O. (1897). Ferdinand von Mueller. *Ber. Deutsch. Bot. Ges.* 15: 56–70.
Willis, J. H. (1971). The genesis of botanical science in Victoria, 1851–1875. *Victorian Hist. Mag.* 42(2): 699–703.
Willis, M. (1949). *By their fruits: a life of Ferdinand von Mueller, botanist and explorer.* (Angus & Robertson: Sydney.)

Revised manuscript received 4 July 1988

NEW GENERA AND SPECIES OF AUSTRALIAN INULEAE (ASTERACEAE)

by

P. S. Short*

ABSTRACT

Short, P. S. New genera and species of Australian Inuleae (Asteraceae). *Muelleria* 7(1): 103–116 (1989). — Five new genera, *Dielitzia* Short, *Feldstonia* Short, *Fitzwillia* Short, *Lemooria* Short and *Sondottia* Short are described. All but *Sondottia* are monotypic. A new species of *Dithyrostegia* A. Gray is described. New species and new combinations are: *Dielitzia tysonii* Short, *Dithyrostegia gracilis* Short, *Feldstonia nitens* Short, *Fitzwillia axilliflora* (W.V. Fitzg. ex Ewart & J. White) Short, *Lemooria burkittii* (Benth.) Short, *Sondottia connata* (W.V. Fitzg.) Short and *S. glabrata* Short.

INTRODUCTION

In a revision of *Angianthus* Wendl. (*sensu* Bentham 1867) I (Short 1983) excluded three species from *Angianthus s. str.*, viz. *A. axilliflorus* W.V. Fitzg. ex Ewart & J. White, *A. connatus* W.V. Fitzg. and *A. burkittii* (Benth.) J.M. Black. At the time I suggested that they may represent monotypic genera or have affinities with other genera which had not been examined. Subsequent investigations have failed to reveal such affinities. Thus, in this paper, each is formally referred to a new genus. Several further taxa, of which I have known for some years, are also described.

Collections from all major Australian herbaria have been examined.

TAXONOMY

Dielitzia Short, gen. nov.

Herba annua, caespitosa, glomerulis foliis circumcinctis; glomeruli sessiles vel in axibus brevibus, tomentosis majores. *Folia* sessilia, integra, infima opposita, superne alterna, sublinearia, tomentosa. *Glomeruli* late ellipsoidei usque oblati; bracteae glomerulos subtendentes involucrum conspicuum glomerulis aequilongum facientes, cartilagineae; receptaculum cupulatum, nudum. *Capitula c.* 4–15. *Bracteae intra capitulum* biseritatae; bracteae exteriores 1–4, setaceae, longo-plumosae; bracteae interiores (2)3–4, hyalinae, marmoratae, apicibus pilis rectis subrigidis praeditis. *Flosculi* 1 in quoque capitulo, tubulare, hermaphroditi. *Corolla* 4 vel 5-lobata. *Styli* rami truncati, apicibus papillatis. *Stamina* 4 vel 5; antherae ad basim caudatae, ad apicem appendicibus sterilibus. *Cypselae* subobovoidae, papillatae; carpopodium absens. *Pappus* setaceus.

Typus: *D. tysonii* Short

Annual herb, tufted, of 1–20 compound heads surrounded by leaves, the compound heads sessile or terminating short, tomentose major axes. *Leaves* sessile, entire, ±linear, at least the lowermost opposite, the upper alternate, tomentose. *Compound heads* broadly ellipsoid to obloid; bracts subtending the compound heads forming a conspicuous involucre the length of the head, the bracts mainly cartilaginous. *General receptacle* cup-like, naked. *Capitula c.* 4–15 per compound head. *Capitular* bracts in 2 rows; outer bracts 1–4, bristle-like, long-plumose; inner bracts (2)3–4, ± hyaline, with brown or blackish marbling, apices with straight, ± rigid hairs $\frac{2}{5}$–$\frac{1}{2}$ the total length of the bracts. *Florets* 1 per capitulum, bisexual. *Corolla* 4 or 5 lobed. *Style* branches truncate; apices papillate. *Stamens* 4 or 5; anthers caudate, each with a sterile apical appendage; filament collar straight in outline and not thicker than the filament. *Cypselas* ±obovoid, minutely papillate; carpopodium absent. *Pappus* setaceus.

*National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

DISTRIBUTION (Fig. 1):

Monotypic. Restricted to inland Western Australia between latitudes *c.* 24° S. and 29° S. and longitudes *c.* 115° E. and 123° E.

ETYMOLOGY:

The generic name is an anagram derived from the surnames and commemorating botanists F. L. E. Diels (1874–1945) and E. G. Pritzel (1875–1946).

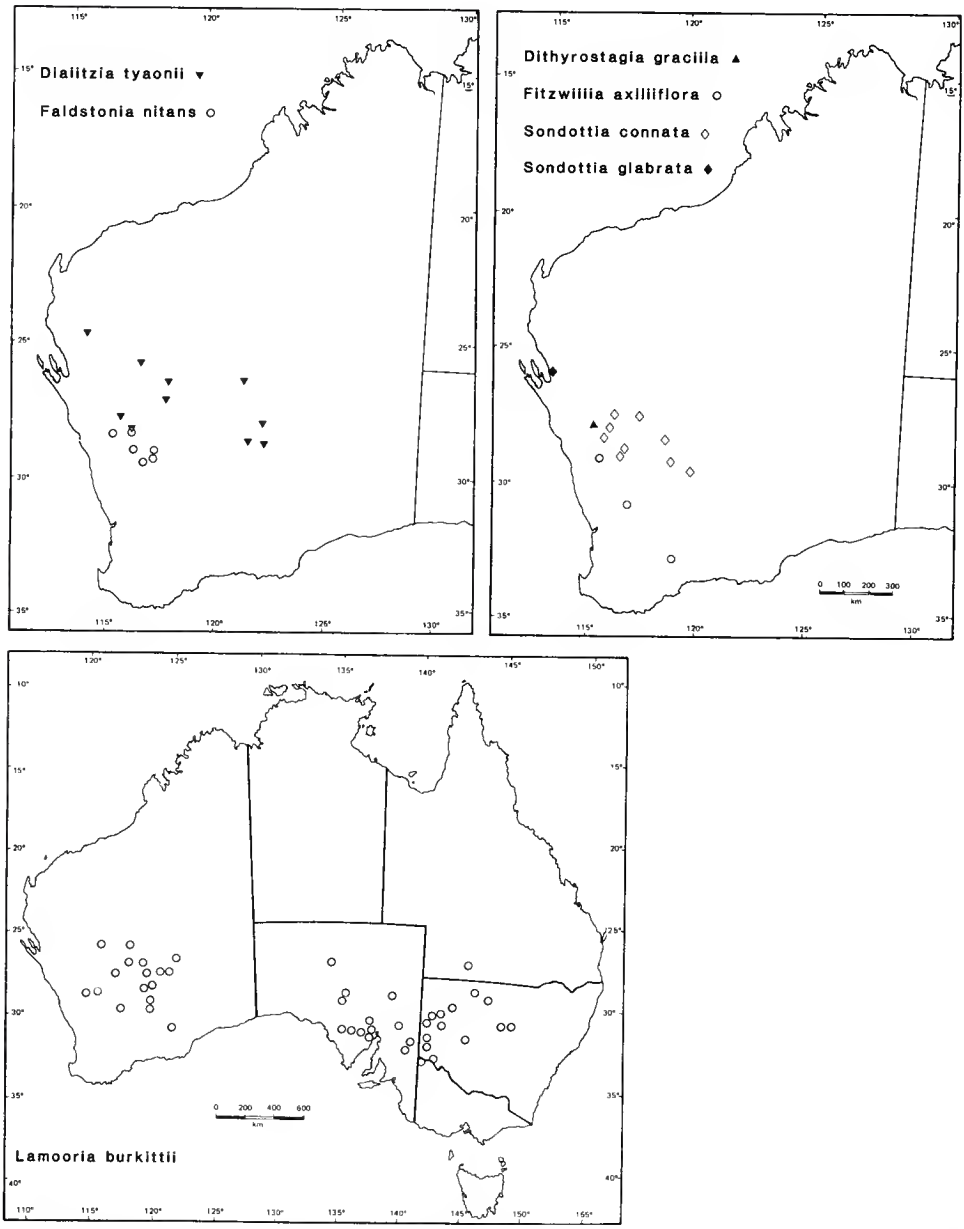

Fig. 1. Distribution of *Dielitzia tysonii*, *Feldstonia nitens*, *Dithyrostegia gracilis*, *Fitzwillia axilliflora*, *Sondottia connata*, *S. glabrata* and *Lemooria burkittii*.

NOTES:

With the exception of *Isoetopsis* the habit alone readily distinguishes this taxon from all other Australian Asteraceae. The cartilaginous bracts of the general involucre, the cup-like general receptacle and the structure of the capitular bracts (particularly the marbled, inner bracts) are features unique to the genus.

Although the general receptacle is described as being glabrous the bristle-like bracts deemed to be the outer capitular bracts could possibly be interpreted as receptacular bracts.

The marbling of the inner bracts is best observed in spirit collections. In herbarium specimens bracts may appear to be more or less uniform in colour.

Dielitzia tysonii Short, sp. nov.

Herba annua, caespitosa, glomerulis 1–20, ab foliis circumcinctis, sessilibus vel in axibus majoribus usque ad 1·5 cm longibus. *Folia* sublinearia, *c.* 1–8 cm longa, 0·08–0·15 cm lata, ad basim dilatatae, submucronatae, semisucculentae, tomentosae. *Glomeruli* late ellipsoidei usque obloidei, 4–6 mm longi, 3–7 mm diametro; bracteae glomerulos subtendentes *c.* 8–12, praecipue cartilagineae sed apicibus hyalinis. *Capitula c.* 4–15. *Bracteae intra capitulum* longitudine *c.* $\frac{2}{3}$–$\frac{3}{4}$ flosculi aequanti. *Flosculi* 1 in quoque capitulo. *Stamina* 4 vel 5; antherae 0·53–0·64 mm longae; microsporangia 0·35–0·48 mm longa; appendices apicales 0·35–0·48 mm longae; pollinis grana in quaque anthera 28–88. *Cypselae* subobovoidea, 1–1·3 mm longae, 0·5–0·6 mm diametro. *Setae pappi c.* 10, barbellatae, ad bases conjunctae, longitudine *c.* $\frac{1}{3}$–$\frac{1}{2}$ corollae aequanti. (Fig. 2).

HOLOTYPUS: Western Australia, 17·2 km NE. of Nallan on Yarrabubba road, 23.viii.1986, *Lander 1389, Fuhrer & Short* (MEL 1556923). ISOTYPI: AD, CANB, K, PERTH, S.

Annual herb, tufted, of 1–20 compound heads surrounded by leaves, the compound heads ± sessile or on major axes to 1·5 cm long. *Leaves* ± linear, *c.* 1–8 cm long, 0·08–0·15 cm wide, expanded at the base, ± mucronate, semisucculent, tomentose. *Compound heads* broadly ellipsoid to obloid, 4–6 mm long, 3–7 mm diam.; bracts subtending compound heads *c.* 8–12, mainly cartilaginous but with hyaline apices. *Capitula c.* 4–15 per compound head. *Capitular* bracts *c.* $\frac{2}{3}$–$\frac{3}{4}$ the length of the florets. *Florets* 1 per capitulum. *Stamens* 4 or 5; anthers 0·53–0·64 mm long; microsporangia 0·35–0·48 mm long; apical appendages 0·16–0·25 mm long; pollen grains 28–88 per anther. *Cypselas* ± obovoid, 1–1·3 mm long, 0·5–0·6 mm diam. *Pappus* bristles *c.* 10, barbellate, of unequal length, fused at the base, *c.* $\frac{1}{3}$–$\frac{1}{2}$ the length of the corolla.

DISTRIBUTION (Fig. 1):

See generic treatment.

ECOLOGY & REPRODUCTIVE BIOLOGY:

Habitat notes suggest a preference for sandy loam to clay soil. Collectors' notes include: 'Growing in open *Acacia* shrubland. Brown sandy loam with gravel. With an array of ephemeral composites including *Gnephosis burkittii*, *Podolepis*, *Cephalipterum drummondii*, *Isoetopsis graminifolia*, *Brachyscome* & *Calotis*', 'Open *Acacia*/*Cassia* scrub. Sandy loam covered with ironstone gravel' and 'Growing on saline clay flat'.

Pollen:ovule ratios were determined for 15 plants from *Short 1519*. The values obtained (range = 204–408; $\bar{x}$ = 329·7; S.D. = 56·7; S.E.$\bar{x}$ = 14·64) indicate a high degree of self-pollination (Short 1981).

ETYMOLOGY:

The specific epithet commemorates Isaac Tyson, a pastoralist who collected the plant in 1893.

NOTES:

Dielitzia tysonii has a marked resemblance in habit to *Isoetopsis graminifolia* Turcz. It is readily distinguished in the field from the latter by its hairy, not glabrous, leaves.

Fig. 2. Holotype sheet of *Dielitzia tysonii*.

SELECTED SPECIMENS EXAMINED (Total 10):

Western Australia — Kennedy Range, 21.viii.1986, *Lander 1368* (MEL, PERTH); *c.* 39 km from Leonora along road to Laverton, 20.viii.1982, *Short 1519* (MEL); Mt Gould, 22.viii.1986, *Short 2552* (MEL, PERTH); 16 km E. of Yalgoo, 15.ix.1973, *Wilson 4149* (PERTH).

Dithyrostegia A. Gray

For a description of this now ditypic genus see Short (1983, p. 201).

Dithyrostegia gracilis Short, sp. nov.

Herba annua. Axes majores erecti, glabri, ramificatione dichotoma. *Folia* sessilia, sublinearia vel lanceolata, 2–9 mm longa, 0·4–2 mm lata, amplexicaules; paginae exteriores glabrae, interiores sparsim glandulosae. *Gomeruli* 3·5–4·5 mm longi, 2·5–3·5 mm diametro; bracteae glomerulos

subtendentes 2, in dimidio inferiore connatae, glabra. *Capitula* 6–20. *Bracteae intra capitulum* 1, hyalinae, integrae. *Florsculi* 1 in quoque capitulo. *Corolla* 5-lobata. *Stamina* 5; antherae 1·3–1·5 mm longae; microsporangia 0·96–1·1 mm longa; appendices apicales 0·34–0·38 longae. *Cypselae* subobovoideae, *c.* 1·3–1·5 mm longae, *c.* 0·6 mm diametro; carpopodium absens. *Setae pappi* laeves, ad basim conjunctae, longitudine *c.* $\frac{1}{6}$ corollae tubi aequanti. (Fig. 3).

HOLOTYPUS: Western Australia, Yuin Station, 2.ix.1975, *Evans s.n.* (PERTH).

Fig. 3. Holotype sheet of *Dithyrostegia gracilis*.

Annual herb, to *c.* 25 cm high. *Major axes* erect, glabrous; branching dichotomous. *Leaves* sessile, ± linear or lanceolate, 2–9 mm long, 0·4–2 mm wide, stem-clasping, outer surfaces glabrous, inner surfaces sparsely glandular. *Compound heads* 3·5–4·5 mm long, 2·5–3·5 mm diam.; bracts subtending compound heads 2, connate in *c.* the lower $\frac{1}{2}$, glabrous; general receptacle beset with long hairs. *Capitula* 6–20 per compound head. *Capitular bracts* 1, hyaline, enveloping the fruit and the lower $\frac{1}{2}$ of the corolla tube, entire. *Florets* 1 per capitulum; corolla 5-lobed, corolla tube *c.* 1·5–2 mm long. *Style* branches truncate, papillate. *Stamens* 5; anthers 1·3–1·5 mm long, caudate; microsporangia 0·96–1·1 mm long; apical appendages 0·34–0·38 mm long. *Cypselas* ± obovoid, *c.* 1·3–1·5 mm long, *c.* 0·6 mm diam., densely silky hairy, carpopodium absent. *Pappus* of smooth bristles fused at the base, *c.* $\frac{1}{6}$ the length of the corolla tube.

DISTRIBUTION (Fig. 1):

Only known from the type collection from south-west Western Australia.

ECOLOGY & REPRODUCTIVE BIOLOGY:

No habitat notes accompany the type specimen.

Anther size and a pollen:ovule ratio of 5,464 determined for a single floret indicate that the species commonly cross-pollinates.

ETYMOLOGY:

The specific epithet refers to the slender habit.

NOTES:

In a previous treatment of *Dithyrostegia* (Short 1983) this species was not described pending further collections. Despite several searches (in 1982, '83 & '86) the species has not been recollected. That it is specifically distinct from *D. amplexicaulis* seems indisputable. The leaves and compound heads are much smaller than in the latter species, the capitular bracts are entire (not with long hairs at the apex) and the general receptacle is sparsely hairy (not woolly).

Feldstonia Short, gen. nov.

Herba annua. Axes majores decumbentes usque ad ascendentes, raro erecti, glabri vel sparsim pilosi. *Folia* sessilia, integra, infima opposita, supera alterna, linearia vel oblanceolata, glabra vel sparsim pilosa. *Glomeruli* late obovoidei usque depresse obovoidei vel depresse ovoidei; involucrum generale multiseriale, conspicuum; bracteae exteriores praecipue virides, opacae, subcartilagineae, glabrae, nitentes, marginibus hyalinis; bracteae interiores praecipue hyalinae, glabrae, costis opacis; receptaculum subconicum, glabrum. *Capitula* 15–50; bracteae capitula subtendentes (0)1(2), subrigidae, praecipue, hyalinae glabrae, costis opacis, interdum parte distali leviter constricta, lutea. *Bracteae intra capitulum* 4–5, in duo serialibus, praecipue hyalinae, planae usque concavae, costa opaca, apice glabera vel sparsim pilosa. *Flosculi* (1)2 in quoque capitulo, tubulare, hermaphroditi, lutei. *Corolla* 5-lobata. *Styli* rami truncati, ad apicem papillati. *Stamina* 5; antherae ad basem caudatae, ad apicem appendicibus sterilibus. *Cypselae* subobovoideae, pubescentes; carpopodium absens. *Pappus* setaceus, setas subplumosas usque plumosas, ad basem conjunctae ferens.

TYPUS: *F. nitens* Short

Annual herb. Major axes decumbent to ascending, rarely erect, glabrous or sparsely hairy. *Leaves* sessile, entire, the lowermost opposite, the upper alternate, linear or oblanceolate, glabrous or sparsely hairy. *Compound heads* broadly obovoid to depressed obovoid or depressed ovoid; general involucre multiseriate, conspicuous; outer bracts mainly green, opaque, semi-cartilaginous, glabrous, shiny, with hyaline margins; inner bracts mainly hyaline, glabrous, with opaque midribs; receptacle ± conical, glabrous. *Capitula* 15–50 per compound head; capitulum-subtending bracts (0)1(2), ± rigid, mainly hyaline, glabrous, midrib opaque, with the upper part of the bract sometimes slightly constricted, yellow. *Capitular bracts* 4–5, in 2 rows, mainly hyaline, flat to concave, midrib opaque and glabrous or with sparsely hairy apices. *Florets* (1)2, tubular, bisexual, yellow; corolla 5-lobed. *Style* branches truncate, apices papillate. *Stamens* 5; anthers caudate, each with a sterile apical appendage;

filament collar straight in outline and not thicker than the filament. *Cypselas* ± obovoid, pubescent, carpopodium absent. *Pappus* setaceus, the bristles subplumose to plumose, united at the base.

DISTRIBUTION (Fig. 1):
Monotypic. Restricted to Western Australia between latitudes *c.* 28° S. and 30° S. and longitudes *c.* 116° E. and 118° E.

ETYMOLOGY:
The name *Feldstonia* is an anagram derived from the surname and commemorates Danish botanist C. E. H. Östenfeld (1873–1931) who published several papers on Western Australian botany. Although an anagram it is regarded as a personal generic name and following Recommendation 20A of the ICBN is given the feminine gender.

NOTES:
A number of attributes, including the semicartilaginous bracts of the general involucre and the combination of features of the fruit, pappus and capitular bracts readily distinguish the genus from others of the Inuleae.

Feldstonia nitens Short, sp. nov.
Herba annua. Axes majores 6–30 cm longi. *Folia* linearia vel suboblanceolata, interdum suprema ovata, 3–40 mm longa, 0·5–2·5 mm lata, submucronata, glabra vel sparsim pilosa. *Glomeruli* late obovoidei usque depresse obovoidei vel depresse ovoidei, 5–8 mm longi, 4–14 mm diametro. *Capitula* 15–50; bracteae capitula subtendentes ovatae usque lanceolatae, 3·4–4·8 mm longae, 1·2–1·5 mm latae. *Bracteae intra capitulum* 3·8–4·1 mm longae, 1·1–1·4 mm latae. *Flosculi* (1)2. *Stamina* 5; antherae 1·6–1·9 mm longae, microsporangia 1·2–1·5 mm longa, appendices apicales 0·38–0·45 mm longae. *Cypselae* subobovoideae, 1·4–1·9 mm longae, 0·6–0·9 mm diametro. *Pappi* setae *c.* 10–15, subplumosae usque plumosae, ad basem conjunctae, longitudine *c.* $\frac{1}{3}$ corollae tubi aequanti. (Fig. 4).

HOLOTYPUS: Western Australia, 19·3 km from Yalgoo along the road to Paynes Find. *Acacia* scrub. Growing with an array of annuals including *Cephalipterum drummondii*, *Pogonolepis*, *Gnephosis* and *Myriocephalus*, 2.ix.1982, *Short 1615* (MEL 621021). ISOTYPI: AD, BRI, CANB, E, GH, HO, K, NSW, PERTH, S.

Annual herb. Major axes 6–30 cm long. *Leaves* linear or ± oblanceolate, the uppermost sometimes ovate, 3–40 mm long, 0·5–2·5 mm wide, mucronate, glabrous or sparsely hairy. *Compound heads* broadly obovoid to depressed obovoid or depressed ovoid, 5–8 mm long, 4–14 mm diam. *Capitula* 15–50 per compound head; capitulum-subtending bracts ovate to lanceolate, 3·4–4·8 mm long, 1·2–1·5 mm wide. *Capitular bracts* 3·8–4·1 mm long, 1·1–1·4 mm wide. *Florets* (1)2; corolla tube 2–2·7 mm long. *Stamens* 5; anthers 1·6–1·9 mm long; microsporangia 1·2–1·5 mm long; apical appendages 0·38–0·45 mm long. *Cypselas* ± obovoid, 1·4–1·9 mm long, 0·6–0·9 mm diam. *Pappus* bristles *c.* 10–15, subplumose to plumose, bases united, *c.* $\frac{1}{3}$ the length of the corolla tube.

DISTRIBUTION (Fig. 1):
See generic treatment.

ECOLOGY & REPRODUCTIVE BIOLOGY:
Collectors' habitat notes include: '*Acacia* scrub. Red-brown loam' and 'Mallee scrub (*Acacia* common). Reddish sandy loam'.
A pollen:ovule ratio of 4,460, determined from a single floret, indicates that the species commonly cross-pollinates.

ETYMOLOGY:
The specific epithet refers to the shiny bracts of the general involucre.

SELECTED SPECIMENS EXAMINED (Total 14):
Western Australia — 9 miles N. of Paynes Find, 23.x.1973, *Demarz 4674* (KP, PERTH); 20 km from

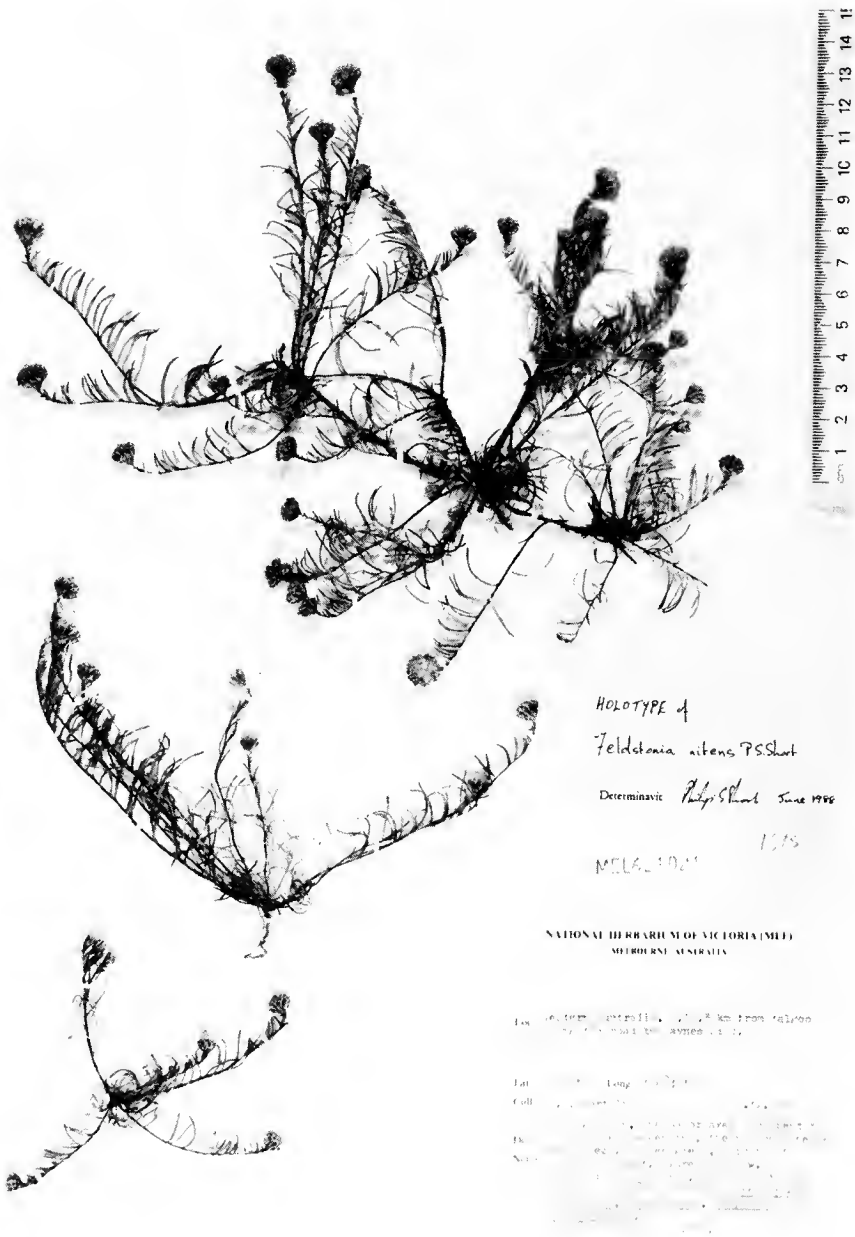

Fig. 4. Holotype sheet of *Feldstonia nitens*.

Yalgoo on Paynes Find road, 21.x.1983, *Short 2155* (MEL); 86 km NE. of Wubin, 29.ix.1986, *Wilson 12350* (MEL, PERTH).

Fitzwillia Short, gen. nov.

Herba annua. Axes majores ascendentes usque erecti, glabri, alis hyalinis; caulis simplex vel e nodis basalibus superioribusque ramificans. *Folia* opposita, sessilia, integra, semisucculenta, glabra, mucronata. *Glomeruli* perdepresse obovoidei usque obovoidei; involucrum generale absens; receptaculum subintegrum. *Capitula* 5–10; bracteae intra capitulum 4(6), integrae, hyalinae, planae usque conduplicatae. *Flosculi* 1 vel 2 in quoque capitulo, tubulares, hermaphroditi, albi. *Corolla* 5-lobata. *Styli* rami truncati, ad apicem papillati. *Stamina* 5; antherae ad basem caudatae, ad apicem appendicibus sterilibus. *Cypselae* subobconicae, villosae; pericarpium ad apicem sclerenchymatum, fascibus vascularibus 2; testa sine fascibus vascularibus; carpopodium absens. *Pappus* subcyathiformis, ciliatus.

TYPUS: *F. axilliflora*

Annual herb. Major axes ascending to erect, glabrous, with hyaline wings; stem simple or forming major branches at basal and upper nodes. *Leaves* sessile, entire, opposite, erect, glabrous, semisucculent, mucronate. *Compound heads* broadly depressed obovoid to obovoid; general involucre absent; receptacle ± entire. *Capitula* 5–10 per compound head; capitulum-subtending bracts leaf-like, glabrous. *Capitular bracts* 4(6), entire, hyaline, flat to conduplicate. *Florets* 1 or 2 per capitulum, tubular, bisexual, white; corolla 5-lobed. *Style* branches truncate, apices papillate. *Stamens* 5; anthers caudate, each with a sterile apical appendage; filament collar straight in outline and not thicker than the filament. *Cypselas* ± obconic, villous; pericarp in mid-transverse section lacking sclerenchyma but the fruit apex with a capping of sclerenchyma, with two, medial/oblique vascular bundles; testa thin, lacking vascular bundles in mid-transverse section; carpopodium absent. *Pappus* cup-like, ciliate.

DISTRIBUTION (Fig. 1):

Monotypic. Restricted to south-west Western Australia. Collections have only been gathered near Cowcowing, Newdegate and Morawa.

ETYMOLOGY:

The name *Fitzwillia* is an anagram derived from the names and commemorating the botanist William V. Fitzgerald (1867–1929). Although an anagram it is regarded as a personal generic name and following Recommendation 20A of the ICBN is given the feminine gender.

NOTES:

The fruit provide the most distinctive feature of this genus although a sclerified capping also occurs in cypselas of *Epitriche demissus* (A. Gray) Short (Short 1989). The leaf-like capitulum-subtending bracts and the arrangement of the capitular bracts are characters unique to the genus. The pale white florets have not been observed in other Australian inuloid species.

Fitzwillia axilliflora (W.V. Fitzg. ex Ewart & J. White) Short, comb. nov.

BASIONYM: *Angianthus axilliflorus* W.V. Fitzg. ex Ewart & J. White, Proc. Roy. Soc. Vict. 22: 315, pl. 56, figs 1–3 (1910), ('*axiliflorus*'); W.V. Fitzg., J. Bot. 50: 21 (1912); Grieve & Blackall, W. Aust. Wildfls 812 (1975); Short, Muelleria 5: 209 (1983). LECTOTYPE (*fide* Short 1983): Cowcowing, Oct. 1904, *Koch 1196* (MEL 541217). ISOLECTOTYPES AND PROBABLE ISOLECTOTYPES: AD, BM (same no. but dated Aug. 1904), MEL 541218, MEL 541219, NSW (2 sheets), PERTH.

Annual herbs, 3–13·5 cm high. *Major axes* ascending to erect, with 2–4 hyaline wings; stem simple or forming shorter major axes at basal and upper nodes, all axes glabrous. *Leaves* lanceolate or ± linear, *c.* 4–7 mm long, 0·7–1·3 mm wide, ± concave, semisucculent, mucronate, glabrous. *Compound heads* broadly depressed obovoid to obovoid, 4·5–7 mm long, 2·5–8 mm diam.; general involucre absent but several leaf-like bracts present. *Capitula* 5–10 per compound head; capitulum-subtending

bracts ± trullate to narrowly trullate or ovate to lanceolate, 4–4·5 mm long, 1·3–2·2 mm wide. *Capitular bracts* 4(5,6), 3·7–4·3 mm long, *c.* the length of the floret. *Florets* 1 or 2, pale white. *Stamens* 5; anthers 1·3–1·6 mm long; microsporangia 1–1·2 mm long; apical appendages 0·33–0·44 mm long. *Cypselas* ± obconic, 1·1–1·4 mm long, 0·6–0·78 mm diam., villous. *Pappus* cup-like, with ciliate margins, *c.* 0·3–0·5 mm long.

DISTRIBUTION (Fig. 1):
See generic treatment.

ECOLOGY & REPRODUCTIVE BIOLOGY:
The species is apparently confined to the margins of salt lakes where it grows amongst samphire in sand or sometimes clay loam.

A pollen:ovule ratio of 7,398, determined from a single floret, indicates that the species commonly cross-pollinates.

SPECIMENS EXAMINED:
Western Australia — Newdegate, 1931, *Blackall 1276* (PERTH); 5 km S. of Morawa, 23.x.1983, *Short 2188* (MEL); 5 km S. of Morawa, 16.ix.1986, *Short 2959* (AD, CANB, MEL, PERTH).

Lemooria Short, gen. nov.

Herba annua. *Axes majores* prostrati, sparsim lanati, pilis glandiferis. *Folia* ad basem opposita, superiora alterna, sessilia, integra, glabra vel pilis glandiferis. *Glomeruli* depresse ovoidei; involucrum generale conspicuum; bracteae 12–18, marginibus hyalinis, dense lanatae; receptaculum ramosum. *Capitula c.* 10–20, sine bracteis subtendentibus. *Bracteae intra capitulum* (4)5–6(8), in ± 2 serialibus, ovatae usque lanceolatae vel ellipticae, planae usque concavae, praecipue hyalinae sed costa viridi, lanatae, marginibus superibus laciniatis. *Flosculi* 1 vel 2, tubulare, hermaphroditi, lutei. *Corolla* 5-lobata. *Styli* rami truncati, ad apicem papillati. *Stamina* 5; antherae ad basem caudatae, ad apicem appendicibus sterilibus. *Cypselae* subobovoideae, fuscae, sparsim papillatae, plerumque apicibus pilos intertextos ferentibus; pericarpium sine sclerenchyma; carpopodium absens. *Pappus* setaceus; setae 8–12, subplumosae, ad basem conjunctae, longitudine *c.* ½ corollae tubi aequanti.

TYPUS: *L. burkittii* (Benth.) Short

Annual herb. Major axes prostrate, sparsely woolly, some glandular hairs present. *Leaves* opposite at the base, the upper alternate, sessile, entire, glabrous or with glandular hairs. *Compound heads* depressed ovoid; general involucre conspicuous, about equal to or longer than the head, bracts 12–18, midribs leaf-like and longer than the wing-like hyaline margins, densely lanate; receptacle branched. *Capitula c.* 10–20; capitulum-subtending bracts absent. *Capitular bracts* (4)5–6(8), in ± 2 rows, ovate to lanceolate or elliptic, flat to concave, mainly hyaline but with green midrib, lanate, the upper margins laciniate. *Florets* 1 or 2, tubular, bisexual, yellow; corolla 5-lobed. *Style* branches truncate, apices papillate. *Stamens* 5; anthers caudate and with sterile apical appendages. *Cypselas* ± obovoid, brown, sparsely papillate, usually with apices with intertwined hairs; pericarp lacking sclerenchyma, vascular bundles two; carpopodium absent. *Pappus* setaceus; bristles 8–12, subplumose and united at the base, *c.* ½ the length of the corolla tube.

DISTRIBUTION (Fig. 1):
Monotypic. Widespread in semi-arid and arid regions of the Australian mainland south of *c.* 26°S.

ETYMOLOGY:
The name *Lemooria* is an anagram commemorating the botanist Spencer Le Marchant Moore (1850–1931). It is of the feminine gender (see note under *Fitzwillia*).

NOTES:
A unique combination of features, i.e. the capitular bracts and bracts of the general involucre, the pappus and fruit, distinguishes *Lemooria* from other inuloid genera. It is one of the most distinctive Australian composites and the species is readily

identified in the field by its reddish, prostrate, somewhat wiry branches terminating in woolly compound heads.

Lemooria burkittii (Benth.) Short, comb. nov.

BASIONYM: *Gnephosis burkittii* Benth., Fl. Austr. 3: 570 (1867); Short, Muelleria 5: 210 (1983). — *Angianthus burkittii* (Benth.) J.M. Black, Fl. S. Aust. 1st ed. 645, pl. 53 (1929), 2nd ed. 925, fig. 1227 (1957). LECTOTYPE (*fide* Short 1983): Lake Gillies, s. dat., *Burkitt s.n.* (MEL 541211). ISOLECTOTYPE: K.

Annual herb. Major axes prostrate, 1·5–10 cm long, reddish, sparsely woolly, some glandular hairs present. *Leaves* linear, 0·5–2 cm long, *c.* 0·03–0·05 cm wide, glabrous or with glandular hairs. *Compound heads* depressed ovoid, 0·6–1·2 cm diam.; bracts subtending the heads *c.* 12–18. *Capitula c.* 10–20 per compound head. *Capitular bracts* (4)5–6(8), ovate to lanceolate or elliptic, 2·8–3·4 mm long, 0·6–1·3 mm wide. *Florets* 1 or 2 per capitulum; corolla tube 1·8–2·5 mm long. *Stamens* 5; anthers 0·19–0·21 mm long; microsporangia 0·39–0·46 mm long; apical appendages 0·19–0·21 mm long. *Cypselas* ± obovoid, 0·7–1·2 mm long, 0·5–0·85 mm diam. *Pappus* of 8–12 subplumose bristles united at the base.

DISTRIBUTION (Fig. 1):

See generic treatment.

ECOLOGY & REPRODUCTIVE BIOLOGY:

A common species in both low and tall shrubland formations. Collectors' notes include: 'On desert loam, on bare eroded patches in community of *Atriplex vesicaria*, with some *Bassia* [*Selerolaena*] species'. 'In open *Acacia* shrubland. Brown sandy loam with gravel . . . with an array of ephemeral composites', 'Tall *Acacia* open shrubland. Clay loam' and 'In red-brown loam in *Dodonaea*/*Ptilotus* shrubland'.

Pollen:ovule ratios determined for *Short 756* and *Short 1520* range from 446 to 696, values indicative of a high degree of self-pollination (Short 1981).

SELECTED SPECIMENS EXAMINED (Total *c.* 120):

Western Australia — 39 km from Leonora along Laverton road, 20.viii.1982, *Short 1520* (MEL); E. edge of Fraser Range, 19.ix.1982, *Short 1761* (MEL).

South Australia — 5 km W. of Nonning Hmsd, 30.viii.1968, *Copley 2035* (AD); Koonamore, 7.viii.1971, *Crisp 283* (AD, CBG).

Victoria — Parish of Olney, 30.viii.1948, *Willis s.n.* (MEL 84577).

New South Wales — Terrananya Stn, 26.vii.1955, *Constable s.n.* (NSW 35571, NT 19057); Fowlers Gap Stn, 30.viii.1973, *Cunningham & Milthorpe 1349* (NSW).

Queensland — 65 km N. of Hungerford, s. dat., *Hocking s.n.* (BRI 192446).

Sondottia Short, gen. nov.

Herba annua. Axes majores ascendentes usque erecti, glabri usque lanati; caulis simplex vel e nodis basalibus superioribusque ramificans. *Folia* opposita, connata, sessilia, integra, glabra vel lanata, submucronata, interdum semisucculenta. *Glomeruli* late ellipsoidei usque obloidei; bracteae glomerulos subtendentes carentes, vel 2 vel 4, marginibus hyalinis. *Capitula* 5–13; bracteae capitula subtendentes virides, praecipue cartilagineae, apicibus hyalinis et interdum marginibus hyalinis, glabrae usque dense lanatae. *Bracteae intra capitulum* 4–6, hyalinae costa opaca, subplanae, glabrae vel sparsim lanatae. *Flosculi* 1 in quoque capitula, tubulare, hermaphroditi, lutei. *Corolla* 5-lobata. *Styli* rami truncati, ad apicem papillati. *Stamina* 5; antherae ad basem caudatae, ad apicem appendicibus sterilibus. *Cypselae* subobovoidae, praecipue glabrae sed apicibus longe pilosis, sine carpopodium. *Pappus* subcyathiformis, laciniatus.

LECTOTYPUS (here chosen): *S. connata* (W.V. Fitzg.) Short

Annual herbs. Major axes ascending to erect, glabrous to lanate; stem simple or forming major branches at basal and upper nodes. *Leaves* opposite, connate, sessile, entire, glabrous or lanate, ± mucronate, sometimes semisucculent. *Compound heads* broadly ellipsoid to obloid; bracts subtending compound heads 0, 2 or 4, with hyaline margins (sometimes several leaf-like bracts present); general receptacle a shortly branched axis. *Capitula* 5–13 per compound head; capitulum-subtending bracts

green, mainly cartilaginous but with hyaline apices and sometimes with very narrow hyaline margins, glabrous to densely lanate, each bract subtending 1–3 capitula. *Capitular* bracts 4–6, hyaline, with opaque midribs, ± flat, glabrous or sparsely lanate. *Florets* 1 per capitulum, tubular, bisexual, yellow; corolla 5-lobed. *Style* branches truncate, apices papillate. *Stamens* 5; anthers caudate, each with a sterile apical appendage; filament collar straight in outline and not thicker than the filament. *Cypselas* ± obovoid, mainly glabrous but with long, intertwined hairs at the apex; carpopodium annular. *Pappus* cup-like, laciniate.

DISTRIBUTION (Fig. 1):
A ditypic genus restricted to Western Australia.

ETYMOLOGY:
The name *Sondottia* is of feminine gender and is an anagram derived from the names and commemorating the botanist Otto Wilhelm Sonder (1812–1881).

NOTES:
The cartilaginous capitulum-subtending bracts are apparently unique to this genus and readily separate it from any other genera with single flowered capitula. Other distinguishing features include the opposite, connate leaves and the intertwined long hairs at the apex of the fruit.

KEY TO SPECIES OF SONDOTTIA

1. General involucre absent or several leaf-like bracts at base of head; upper axes lanate ..... 1. *S. connata*
1. General involucre of 2 or 4 bracts with broad, hyaline margins; upper axes ± glabrous ..... 2. *S. glabrata*

Sondottia connata (W.V. Fitzg.) Short, comb. nov.
BASIONYM: *Angianthus connatus* W.V. Fitzg. J. West Aust. Nat. Hist. Soc. 2: 24 (1905); Grieve & Blackall, W. Aust. Wildfls 816 (1975); Short, Muelleria 5: 209 (1983). LECTOTYPE (*fide* Short 1983); Mingenew, Sept. 1903, *Fitzgerald s.n.* (NSW 138682). ISOLECTOTYPES: NSW 138683, PERTH.

Annual herb, *c.* 3–12 cm high. *Major axes* ascending to erect, mainly glabrous but the upper part lanate; stem simple or forming branches at basal and upper nodes. *Leaves* linear, *c.* 5–13 mm long, 0·5–1·4 mm wide, often semisucculent, mucronate, usually glabrous but the uppermost leaves sometimes lanate. *Compound heads* obovoid, *c.* 6·5–10 mm long, 3·5–5 mm diam.; general involucre absent but one or several leaf-like, lanate bracts with small, hyaline apices may be present at the base of the head. *Capitula* *c.* 5–13 per compound head; capitulum-subtending bracts ± elliptic to narrowly elliptic or obovate, 3·6–5·2 mm long, 0·55–1·9 mm wide, mainly cartilaginous and green but with hyaline apices and sometimes very narrow (<0·1 mm) hyaline margins, sparsely to densely lanate, each bract subtending 1–3 capitula. *Capitular bracts* 5–6, narrowly elliptic or linear, 3–3·8 mm long, 0·3–0·5 mm wide, *c.* the length of the florets, usually mainly hyaline but sometimes the opaque midrib more prominent, glabrous or sparsely lanate. *Florets* 1 per capitulum; corolla tube 2·2–2·6 mm long. *Stamens* 5; anthers 1·4–1·5 mm long; microsporangia 0·95–1 mm long; apical appendages 0·43–0·48 mm long. *Cypselas* ± obovoid, 1·6–1·85 mm long, 0·5–0·7 mm diam. *Pappus* cup-like, laciniate, *c.* 0·2 mm long.

DISTRIBUTION (Fig. 1):
Restricted to Western Australia between latitudes *c.* 27° S. and 30° S. and 116° E. and 121° E.

In the revision of *Angianthus s. lat.* (Short 1983) it was erroneously recorded that the species was only known from the type locality. It is moderately common.

ECOLOGY & REPRODUCTIVE BIOLOGY:

The species occurs in an array of arid habitats but seems to be most common in saline environments. Collectors' notes include: 'Sandy loam with ironstone gravel, with scattered *Atriplex* shrubs', 'In sand and very sandy loam amongst *Acacia*, *Eremophila* shrubs' and 'Beneath *Acacia* shrubs amongst samphire. Loam.'

Pollen:ovule ratios have not been obtained for this species but from anther size it is evident that several thousand pollen grains occur in each floret, suggesting that cross-pollination commonly occurs (Short 1983).

SELECTED SPECIMENS EXAMINED (Total 15):

Western Australia — Hospital Rocks, 8.x.1983, *Short 1998* (AD, MEL, PERTH); 26 km S. of Cue, 14.ix.1986, *Short 2921* (MEL, PERTH); 6 km S. of Warriedar, 26.ix.1986, *Wilson 12293* (MEL, PERTH); Lake Austin, *c.* 15 km S. of Cue, 28.ix.1986, *Wilson 12326* (MEL, PERTH).

Sondottia glabrata Short, sp. nov.

Herba annua, usque ad 40 cm alta. *Axes majores* erecti, glabrati. *Folia* praecipue linearia, usque ad *c.* 10 mm longa et *c.* 1 mm lata, glabra, summa subovata usque lanceolata basibus hyalinis. *Glomeruli* subobovoidei vel ellipsoidei, 6–7 mm longi, 3–4 mm diametro; bracteae glomerulos subtendentes 2 vel 4, subovatae vel ellipticae, 4·5–5 mm longae, 2·5–3·3 mm latae, subglabrae usque lanatae, marginibus hyalinis 0·7–1·33 mm latis. *Capitula* 4–8; bracteae capitula subtendentes anguste ellipticae vel oblanceolatae, 3·7–4·3 mm longae, 0·7–1·3 mm latae, sparsim usque dense lanatae. *Bracteae intra capitulum* 4–5, anguste ellipticae vel lanceolatae, 2·8–3·7 mm longae, 0·2–0·5 mm latae, sparsim lanatae. *Flosculi* 1 in quoque capitulo. *Corollae* tubus 2·4–2·7 mm longus. *Stamina* 5; antherae 1·6–1·9 mm longae; microsporangia 1·3–1·6 mm longa; appendices apicales 0·3–0·34 mm longae. *Cypselae* subobovoideae, 1·4–1·6 mm longae, 0·45–0·6 mm diametro. *Pappus* subcyanthiformis, laciniatus, 0·2–0·5 mm longus. (Fig. 5).

HOLOTYPUS: Western Australia, *c.* 6 km S. of Wooramel River along the north-west coastal highway. Chenopod/*Acacia* shrubland. Compact sandy loam, 16.x.1983, *Short 2088* (MEL 1523448). ISOTYPUS: PERTH.

Annual herb, to *c.* 10 cm high. *Major axes* erect, ± glabrous; stem forming branches at basal and upper nodes. *Leaves* mainly linear, to *c.* 10 mm long, *c.* 1 mm

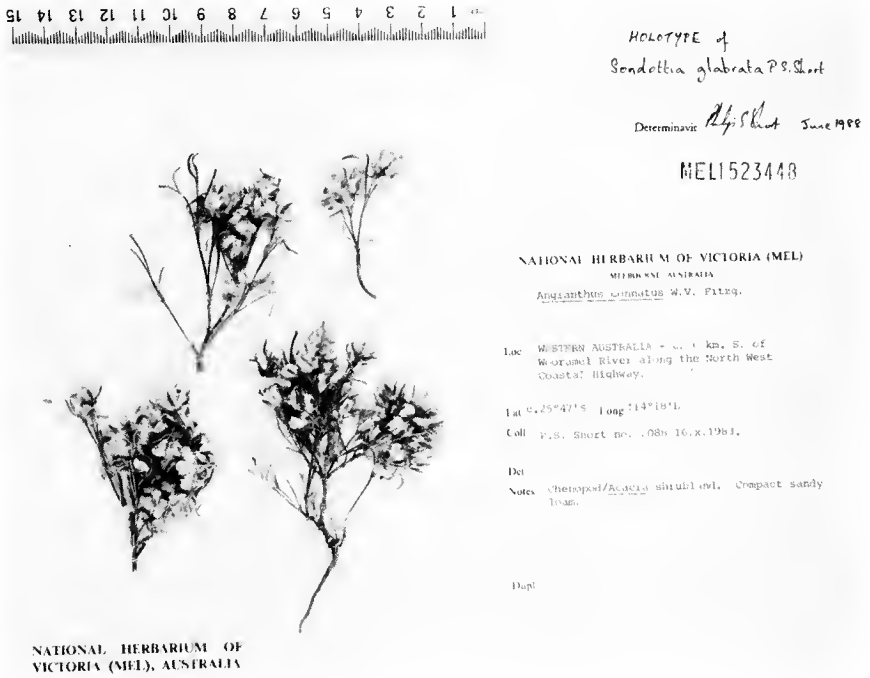

Fig. 5. Holotype sheet of *Sondottia glabrata*.

wide, glabrous, the uppermost ±ovate to lanceolate and with hyaline bases. *Compound heads* ±obovoid to ellipsoid, 6–7 mm long, 3–4 mm diam.; bracts subtending compound heads 2 or 4, *c.* the length of the head, ±ovate or elliptic, 4·5–5 mm long, 2·5–3·6 mm wide, ±glabrous to lanate, with hyaline margins 0·7–1·33 mm wide. *Capitula* 4–8 per compound head; capitulum-subtending bracts narrowly elliptic or oblanceolate, 3·7–4·3 mm long, 0·7–1·3 mm wide, mainly cartilaginous and green but with hyaline apices and sometimes with narrow (<0·1 mm) hyaline margins, sparsely to densely lanate, each bract subtending 1 capitulum. *Capitular bracts* 4–5, narrowly elliptic or lanceolate, 2·8–3·7 mm long, 0·2–0·5 mm wide, to *c.* $\frac{3}{4}$ the length of the florets, mainly hyaline but with an opaque midrib, sparsely lanate. *Florets* 1 per capitulum; corolla tubes 2·4–2·7 mm long. *Stamens* 5; anthers 1·6–1·9 mm long; microsporangia 1·3–1·6 mm long; apical appendage 0·3–0·34 mm long. *Cypselas* ±obovoid, 1·4–1·6 mm long, 0·45–0·6 mm diam. *Pappus* cup-like, laciniate, 0·2–0·5 mm long.

DISTRIBUTION (Fig. 1):

Only known from the vicinity of the Wooramel River, Western Australia.

ECOLOGY & REPRODUCTIVE BIOLOGY:

Habitat notes indicate that the species occurs in chenopod (mainly *Atriplex*)/*Acacia* shrubland.

As with *S. connata* this species, as indicated by anther size, probably has a pollen:ovule ratio of several thousand. Therefore cross-pollination is likely to be common (Short 1983).

SPECIMENS EXAMINED: (2, including type)

Western Australia — *c.* 28 km S. of Wooramel River along the north-west coastal highway, 16.x.1983, *Short 2094* (MEL).

ACKNOWLEDGEMENTS

I thank Dr W. R. Barker for assisting with the Latin descriptions and my colleagues at MEL for general assistance with the manuscript.

From 1982 to 1987 my work on the Australian Inuleae was partly funded by an Australian Biological Resources Study Grant.

REFERENCES

Short, P. S. (1981). Pollen-ovule ratios, breeding systems and distribution patterns of some Australian Gnaphaliinae (Compositae: Inuleae). *Muelleria* 4: 395–417.

Short, P. S. (1983). A revision of *Angianthus* Wendl. *sensu lato* (Compositae: Inuleae: Gnaphaliinae). *Muelleria* 5: 143–214.

Short, P. S. (1989). Notes on the fruit anatomy of Australian members of the Inuleae (Asteraceae). *Muelleria* 7(1): 57–79.

Manuscript received 20 July 1988

OLEARIA ARCHERI (ASTERACEAE: ASTEREAE), A NEW NAME FOR A FAMILIAR SPECIES FROM TASMANIA

by

N. S. LANDER*

ABSTRACT

Lander, N. S. *Olearia archeri* (Asteraceae: Astereae), a new name for a familiar species from Tasmania. *Muelleria* 7(1): 117–121 (1989). — The neotypification by D. I. Morris of *Olearia persoonioides* var. *lanceolata* Benth. is shown to be superseded by the rediscovery of original material, here designated as the lectotype. A new species, *Olearia archeri*, is described and illustrated.

INTRODUCTION

D. I. Morris (1977) raised *Olearia persoonioides* (DC.) Benth. var. *lanceolata* Benth. to specific rank as *O. lanceolata* (Benth.) D. I. Morris. In the process of doing this Morris designated a neotype for the variety stating that 'it has not been possible to locate Bentham's type'.

Bentham (1867) cited no material in his protologue of *O. persoonioides* var. *lanceolata*. However, examination of *Olearia* specimens held at major Australian, British and Continental herbaria in the course of my ongoing revisionary studies in this genus has brought to light a specimen at K, originally from the Herbarium Hookeranum, annotated by J. D. Hooker as '*E*[*urbyia*] *persoonioides β lanceolata*' and subsequently annotated by Bentham as '*Olearia persoonioides* Benth. var. *lanceolata*' (Fig. 1). A small printed label reads 'FLORA AUSTRALIENSIS, named by Mr BENTHAM'; a handwritten note gives the relevant volume and page reference. Although it bears no collector's name, this specimen bears a typical R. C. Gunn label with the number 1142/1842 and was gathered at Mt Wellington on 1 March 1839.

The protologue of *O. persoonioides* var. *lanceolata* Benth. distinguishes it from the type variety as follows: 'Leaves lanceolate, almost acute. Flower heads fewer, but scarcely larger. Achenes glabrous.' The specimen described above matches this protologue in all details and it is the only original material encountered that is so annotated as a variety of *O. persoonioides* by Bentham. Thus its rediscovery supersedes Morris' neotypification: it is here designated as the LECTOTYPE of *Olearia persoonioides* var. *lanceolata* Benth. Duplicates (ISOLECTOTYPES) of this collection are held at HO and NSW.

Eurybia persoonioides var. *lanceolata* J.D. Hook. is validly and legitimately published (Hooker 1847) and, as the above specimen is clearly cited by Hooker, it must be accepted as the holotype. Neither this name or any reference to its place of publication is given by Bentham (1867) in his treatment of *O. persoonioides*.

The holotype of Hooker's *Eurybia persoonioides* var. *lanceolata*, and the lectotype of Bentham's *Olearia persoonioides* var. *lanceolata*, represents a narrow-leaved form of *O. persoonioides* of trivial significance taxonomically. It bears little resemblance to Morris' neotype which belongs unequivocally to the familiar and distinctive species hitherto known erroneously as *O. lanceolata*, which thus stands in need of a new name.

Olearia archeri Lander, nom. nov.

Species *Olearia persoonioidi* et *O. tasmaniae* affinis a quibus bracteis involucralibus ferentibus pilos glanduliferos, capitulis pedunculo communi, basibus antherae breviter sagittatis, appendicibus antherae ovatis, et stylo ferenti pilos T-formes differt. (Fig. 2).

*Western Australian Herbarium, Department of Conservation & Land Management, P.O. Box 104, Como, Western Australia, Australia 6152.

Fig. 1. Holotype of *Eurybia persoonioides* var. *lanceolata* J.D. Hook. and lectotype of *Olearia persoonioides* var. *lanceolata* Benth. Scale in cm.

TYPUS: Cash's Lookout, Eaglehawk Neck, Tasmania, 10 November 1973, *D. & A. Ratkowsky s.n.* (HOLOTYPUS: HO. ISOTYPI: K, Queen Victoria Museum, Launceston — *n.v.*)

MISSAPPLIED NAMES:

Olearia lanceolata auct. non (Benth.) D. I. Morris (1977) *nec* F. Muell. ex Sonder (1853); D. I. Morris, Rec. Queen Victoria Mus. 55: 1 (1977). — *Olearia persoonioides* var. *lanceolata auct. non* Benth.; L. Rodway, Tas. Fl. 74 (1903); W. Curtis, Stud. Fl. Tasm. 2: 304 (1963).

Shrub to 2 m high. *Vestiture* of stems, petioles, leaves, peduncles and involucral bracts pannose with multicellular, T-shaped, eglandular hairs. *Stems* erect, pinkish brown to yellowish grey when young, becoming brownish grey, striate and fissured. *Leaves* alternate and scattered basally, opposite and crowded apically, ascending, petiolate; petiole 3–7 mm long; lamina flat, narrowly elliptic, 12–99×3–15 mm, discolorous, pale yellowish brown abaxially, green adaxially; venation distinct, reticulate; vestiture pannose abaxially, subglabrous adaxially with multicellular,

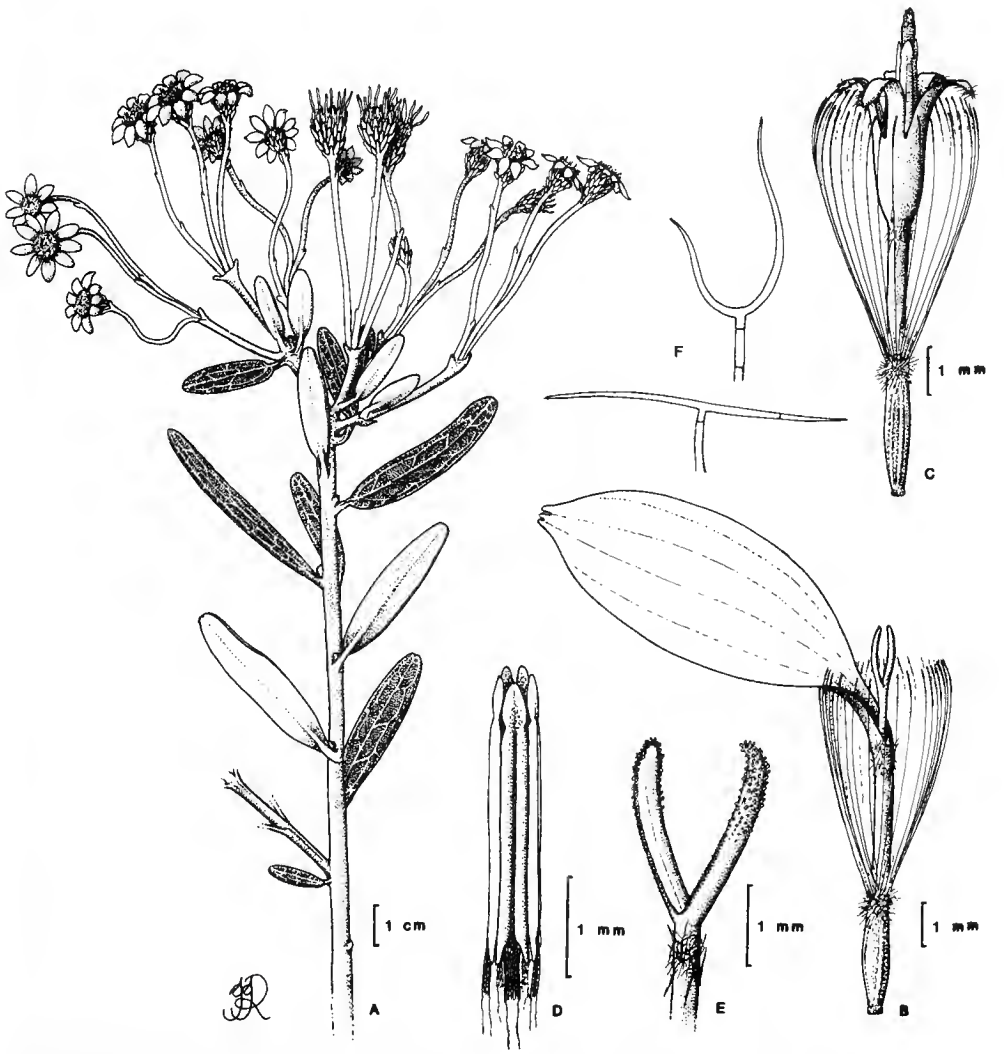

Fig. 2. *Olearia archeri* Lander. A — Habit. B — Ray floret. C — Disc floret. D — Anther tube. E — Stylar arms with T-shaped hairs. F — T-shaped hairs. Drawn from the holotype.

uniseriate, capitate glandular hairs; texture coriaceous; base acute or rounded; margin entire, flat; apex rounded, muticous. *Heads* pedunculate, in 3-headed corymbose clusters forming large, terminal compound-corymbose conflorescences on a common peduncle, conspicuously radiate, 15·8–20·2 mm in diameter. *Peduncle* to 82 mm long with several leaf-like bracts grading into those of the involucre. *Involucre* campanulate; bracts 5–7-seriate, 2·7–8·6×0·8–1·6 mm. *Outer involucral bracts* somewhat cymbiform, narrowly triangular; stereome green, basally pannose abaxially with scattered multicellular, biseriate, capitate hairs, chartaceous; margin fimbriate; apex rounded. *Inner involucral bracts* flat, narrowly triangular or elliptic; stereome green, pannose abaxially and densely glandular basally, chartaceous; margin fimbrate; apex acute. *Receptacle* weakly convex. *Ray florets* 7–9, uniseriate, white, 13·1–16·4 mm long; tube weakly hairy centrally with T-shaped hairs; ligule elliptic, 8·8–11·2×3·5–4·2 mm, glabrous, acute, minutely 3-lobed apically; stylar arms filiform, 1·5–1·7 mm long. *Disc florets* 19–27, bisexual, yellow, infundibular, 8·6–9·6 mm long, with scattered T-shaped hairs centrally to apically; lobes 5, 2·5–3·2 mm long, acute; anthers 2·5–2·9 mm long, briefly sagitate basally and shorter than the filament collar, with ovate sterile appendage; filament collar 0·5–0·8 mm long; stylar arms 2·2–2·4 mm long, with scattered T-shaped hairs below the point of bifurcation, with half-conic sterile appendages bearing botuliform papillae above the stigmatic lines. *Achene* narrowly ellipsoid, 3·3–4·7×0·6–1·0 mm, brown, densely hairy apically with T-shaped hairs; venation indistinct; carpopodium central or slightly oblique. *Pappus* biseriate, with 66–85 barbellate bristles subequal to the tubular florets, with the barbs longer towards the apex.

Other Specimens Examined (Total number examined 15):

Tasmania — Franklin Road, 43° 05′ S., 147° 01′ E., Oct. 1974, *M. Allan s.n.* (HO); Maria Range, Maria Island, 42° 37′ S., 148° 06′ E., *M.J. Brown 224* (HO); Nichols Cap, 41° 45′ S., 148° 16′ E., May 1984, *P. Collier s.n.* (HO); Mt Andrew, *P. Collier 974* (HO); Nichols Cap, W. of Seymour Beach, 41° 45′ S., 148° 16′ E., Jan. 1979, *S. Harris s.n.* (HO); McGregors Peak, *W.D. Jackson s.n.* (HO); Nichols Cap, 41° 33′ S., 148° 06′ E., *A. Moscal 183* (HO); Franklins Road, Kellevie, 42° 47′ S., 147° 48′ E., Nov. 1974, *D.A. & A.V. Ratkowsky 1317* (CANB, HO, K); Hospital Creek, Kellevie, 42° 47′ S., 147° 48′ E., Dec. 1973, *D.A. & A.V. Ratkowsky s.n.* (HO); Prossers Sugar Loaf, 42°s 40′ S., 147° 49′ E., Sept. 1973, *D.A. & A.V. Ratkowsky s.n.* (HO); E. of Coppin, Kellevie, 42° 47′ S., 147° 48′ E., 1973, *D.A. & A.V. Ratkowsky s.n.* (K); NE. coast, s.dat., *L. Rodway s.n.* [ex herb. *Rodway 334*] (HO).

Cultivated — Royal Botanic Gardens, Kew, Richmond, Surrey, England, anno. 1976, s.leg. (K).

Distribution:

On the east coast of Tasmania between 41° and 43° S., from near sea level to an altitude of 650 m.

Ecology:

In shady situations in open sclerophyll forest on hillsides and stony slopes. Flowering September to March.

Notes:

The T-shaped hairs found on the stems, dorsal leaf surfaces, involucral bracts, florets, styles and achenes of this species place it in *Olearia* sect. *Dicerotriche* Archer ex Benth. where it would appear to be closely related to *O. persoonioides* and *O. tasmanica* W. Curtis. Apart from the obvious differences in leaf shape and size, *O. archeri* can be distinguished from both these taxa by the glandular hairs found on its involucral bracts, the clusters of heads on a common peduncle, its basally briefly sagitate rather than distinctly tailed anther bases, its ovate rather than triangular anther appendages, and the T-shaped hairs on its styles. A curious feature of both *O. archeri* and *O. tasmanica* is the complete absence of the duplex hairs which predominiate on the achenes of *O. persoonioides.*

The specific epithet honours William Archer (1820–1874), the pioneering botanical collector in Tasmania, whose study of trichome and pappus morphology in *Olearia* laid the ground for subsequent delimitation and classification of the genus (Archer 1861).

ACKNOWLEDGEMENTS

I wish to thank Mr J. J. Rainbird for technical assistance and for preparing the illustration, and Mr M. I. H. Brooker for providing the Latin diagnosis.

I am indebted to Ms Gillian Perry (PERTH) and an anonymous referee for their advice on the typification of *Olearia persoonioides* var. *lanceolata* Benth.

Much vital background work towards my ongoing revision of Australian Olearia was carried out during my assignment as Australian Botanical Liaison Officer at Kew during 1984–5. This work has been further supported by Australian Biological Resources Study Grants in 1988 and 1989.

REFERENCES

Archer, W. (1861). On the value of hairs, as a character in determining the limits of subordinate groups of species, considered in connexion with the genera *Eurybia* (Cass.) and *Olearia* (Mönch), of Compositae. *Proc. Linn. Soc. London* 5: 17–25.

Bentham, G. (1867). 'Flora Australiensis', vol. 3. (Lovell Reeve & Co.: London.)

Hooker, J. D. (1847). Florae tasmaniae spicilegium. *Lond. J. Bot. (Hooker)* 6: 106–125.

Morris, D. I. (1977). Miscellaneous notes on endemic Tasmanian plants in the genera *Olearia, Ixodia, Danthonia, Tetrarrhena. Records of the Queen Victoria Museum* 55: 1–5.

Received 21 July 1988

OLEARIA ASTROLOBA (ASTERACEAE: ASTEREAE), A NEW SPECIES ENDEMIC TO VICTORIA

by

N. S. LANDER* and N. G. WALSH†

ABSTRACT

Lander, N. S. & Walsh, N. G. *Olearia astroloba* (Asteraceae: Astereae), a new species endemic to Victoria. *Muelleria* 7(1): 123–125 (1989). — *Olearia astroloba* Lander & N.G. Walsh, a new species known from a single, small population in Gippsland, Victoria, is described and illustrated. Its conservation status is discussed.

INTRODUCTION

Olearia Moench (Asteraceae:Astereae) in Australia is currently the subject of ongoing revisionary studies by the first author. A recently discovered species, '*Olearia* sp. (Nunniong)' of Forbes & Ross (1988), would appear to represent one of Victoria's most geographically restricted plants. It is described here in order to facilitate gazetting it for conservation purposes.

Olearia astroloba Lander & N. G. Walsh, sp. nov.

Species *Olearia phlogopappae* affinis a qua capitulis solitariis terminalibus sessilibusque, flosculis tubuliformibus purpureis habentibus lobos abaxialiter pilis stellatis differt. (Fig. 1).

TYPUS: Victoria, Gippsland, Marble Gully area, 200 m S. from Old Hut Ceeek, *c.* 6km E. of 'Bindi', 37° 05′ 05″ S., 147° 51′ 30″ E., altitude 840 m, 30 June 1988, *N.G. Walsh 2086 & D.E. Albrecht* (HOLOTYPUS: MEL 1557910. ISOTYPI: AD, PERTH).

Shrub to 0·5 m high. *Vestiture* of stems, leaves and outer involucral bracts densely pannose with stellate hairs. *Stems* erect, smooth, pale green when young, becoming brown. *Leaves* alternate, crowded, inclined, sessile; lamina somewhat incurved, spathulate, 5–18×2–9 mm, somewhat discolourous, greyish green, abaxially paler, smooth; venation obscure apart from midrib; texture somewhat coriaceous; base attenuate; margin dentate towards the apex, thickened or revolute; apex obtuse, muticous. *Heads* solitary, terminal, sessile, conspicuously radiate, 15–32 mm in diameter; disc *c.* 6 mm in diameter. *Involucre* obconic; bracts 3–4-seriate, 4·0–7·2×1·0–1·3 mm. *Outer involucral bracts* flat, narrowly triangular; stereome green; margin chartaceous, entire; apex narrowly acute. *Inner involucral bracts* flat, narrowly ovate; stereome green; margin chartaceous, fimbriate, with scattered basally stellate hairs; apex acute. *Receptacle* slightly convex. *Ray florets c.* 20, mostly uniseriate, female, 11·1–15·5 mm long; tube with abaxial, multicellular, biseriate, eglandular hairs scattered centrally to apically; ligule narrowly elliptic, 7·4–12·5×1·8–3·0 mm, violet, glabrous, obtuse and minutely 3-lobed apically; staminodes absent; styler arms filiform, 1·3–1·6 mm long. *Disc florets c.* 12–35, bisexual, purple, becoming pale basally, infundibular, 5·5–6·5 mm long, with multicellular, biseriate, simple eglandular hairs scattered abaxially; lobes 5, 1·0–1·5 mm long, acute, weakly stellate-hairy abaxially; anthers 1·9–2·2 mm long, narrowly acute basally and shorter than the filament collar, with narrowly ovate to triangular, sterile apical appendage; filament collar 0·3–0·4 mm long; stylar arms 1·3–1·5 mm long with half-conic, sterile apical appendages bearing botuliform papillae above the stigmatic lines. *Achene* narrowly obovoid, 2·1–2·5×0·7–1·0 mm, brown or purplish, sericeous with duplex hairs; venation distinct with 6 ribs; carpopodium slightly oblique. *Pappus* biseriate with an inner row of 20–24 free, minutely barbellate bristles subequal to the

*Western Australian Herbarium, Department of Conservation & Land Management, P.O. Box 104, Como, Western Australia, Australia 6152.
†National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

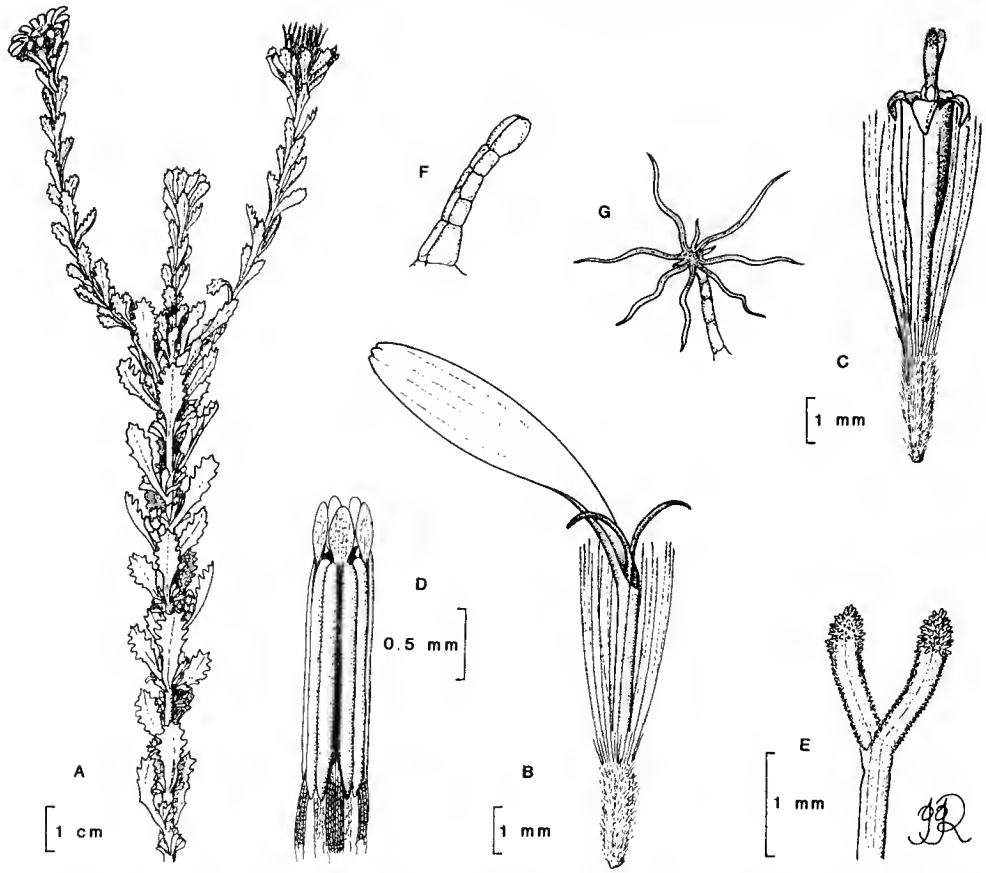

Fig. 1. *Olearia astroloba* Lander & N. G. Walsh. A — Habit. B — Ray floret. C — Disc floret. D — Anther tube. E — Stylar arms. F — Multicellular, biseriate, simple, eglandular hair from floral tube. G — Stellate hair from leaf. Drawn from the original collection, *K.C. Norris & P. Kelly s.n.* (MEL 1555686).

tubular florets and an outer row of many shorter, flattened, minutely barbellate bristles. *Chromosome number*: $n = 9$ (from holotype).

OTHER SPECIMENS EXAMINED (Total number examined 6):

Victoria — type locality, 30 June 1988, *N.G. Walsh 2087 & D.E. Albrecht* (MEL 1557922, NSW, PERTH), *N.G. Walsh 2093* (MEL 1557921); Marble Creek (= Old Hut Creek) which flows into 'Bindi' below NW. extremity of Nunniong Plateau 3·5 km NE. from Mt Simson, *c.* 64 km due N. from Bruthen, 37° 05′ 05″ S., 147° 50′ 45″ E., Victoria, 29 June 1987, *K.C. Norris & P. Kelly s.n.* (MEL 1555686); same locality as previous, 29 June 1988, *N.G. Walsh 2085 & D.E. Albrecht* (CANB, MEL 1557919, PERTH).

DISTRIBUTION:

Olearia astroloba is known from a single population of *c.* 1,000 plants over an area of *c.* 40 ha in eastern Victoria. The area is included in the Victorian Alpine Study Area (Land Conservation Council 1977) and overlaps the boundary between the Victorian 10′ Plant Grids W5 and W6 (Churchill & de Corona 1972).

ECOLOGY AND CONSERVATION STATUS:

Soils at the site are skeletal, light reddish loams derived from marble occurring at a geological interface between Silurian sediments and rhyolitic Snowy River Volcanics. Plants occur only on slopes of north to north-westerly aspect, of incline mostly more than 30°, or occasionally on sheer cliff-faces. The predominant community at the site is a dense shrubland dominated by *Pomaderris oraria* F. Muell.

sens. lat. with occasional emergents of *Allocasuarina verticillata* (Lam.) L. Johnson and *Eucalyptus nortonii* (Blakely) L. Johnson.

The site supports a unique association of rare or disjunctly occurring species, including *Helichrysum adnatum* (DC.) Benth., *Pimelea flava* subsp. *dichotoma* (Schldl.) Threlfall and *Pultenaea densiflora* F. Muell. The *Helichrysum* is known from only one other site in Victoria (near Suggan Buggan, *c.* 50 km to the NE. and the *Pimelea* and *Pultenaea* are not known elsewhere in eastern Victoria, being plants typically of mallee scrubs in the north-west of the state.

The site lies on unreserved crown land, approximately 2 km from a freehold grazing property. Its security from a conservation perspective is uncertain as it is currently the subject of an application for a permit to quarry marble.

Peak flowering of *Olearia astroloba* appears to be June–July, but occasional flowers have been observed as late as November.

This species is proving to be amenable to propagation from cuttings and specimens are being raised at the Royal Botanic Gardens, Melbourne, and at a private nursery at Swifts Creek in Gippsland near the Marble Gully site.

O. astroloba is regarded as a vulnerable species and its conservation code is assessed as 2V (Briggs & Leigh, in press).

NOTES:

The presence of stellate hairs on the vegetative parts of *O. astroloba* is typical of *Olearia* sect. *Asterotriche* Archer ex Benth. (Bentham 1867) where this species would seem best placed, pending the completion of revisionary studies in the genus. The characteristic leaf morphology, the solitary, terminal, sessile heads, and the blue tubular florets with their weakly stellate-hairy lobes (from which feature the specific epithet is derived) readily distinguish it from other species in the section. Its affinities would seem to lie with *O. phlogopappa* (Labill.) DC. *sens. lat.* Occasional specimens of the latter species and of *O. asterotricha* (F. Muell.) F. Muell. ex Benth. also have stellate hairs on the lobes of their tubular florets.

ACKNOWLEDGEMENTS

We are grateful to Mr J. J. Rainbird (PERTH) for technical assistance and for preparing the illustration, to Dr P. S. Short (MEL) for the chromosome count, to Mr M. I. H. Brooker (CANB) for providing the Latin diagnosis, and to Mr K. C. Norris and Mr P. Kelly (Bairnsdale Region, Department of Conservation, Forests and Lands) and Mr D. E. Albrecht (MEL) for their collection and field observations of *Olearia astroloba*.

REFERENCES

Bentham, G. (1867, not 1866). 'Flora Australiensis', vol. 3. (Lovell Reeve & Co.: London.) *Olearia*, pp. 463–488.

Briggs, J. D. & Leigh, J. H. (in press). Rare or threatened Australian plants: the 1988 revised edition. *Australian National Parks & Wildlife Service Special Publication* 14.

Churchill, D. M. & de Corona, A. (1972). 'The Distribution of Victorian Plants'. (Royal Botanic Gardens & National Herbarium, and Botany Department, Monash University: Clayton.)

Forbes, S. J. & Ross, J. H. (1988). 'A Census of the Vascular Plants of Victoria'. Edn 2. (National Herbarium of Victoria: S. Yarra.)

Land Conservation Council (1977). 'Report on the Alpine Study Area'. (Land Conservation Council: Melbourne.)

Manuscript received 21 July 1988

VALID PUBLICATION OF THE NAMES *TORRENTICOLA* AND *T. QUEENSLANDICA* (PODOSTEMACEAE)

by

HELEN I. ASTON*

ABSTRACT

Aston, Helen I. Valid publication of the names *Torrenticola* and *T. queenslandica* (Podostemaceae). *Muelleria* 7(1): 127–129 (1989). — This article provides the correct citations for the names *Torrenticola* and *T. queenslandica* and discusses the early publications where these names occurred both invalidly and validly.

CITATIONS

There is considerable variation in the literature as to when, where and by whom the generic name *Torrenticola* and the specific name *T. queenslandica* were validly published under the International Code of Botanical Nomenclature (Greuter *et al.* 1988). The correct citations for these names, together with some previously used incorrect citations, are given here and a discussion of them follows.

Torrenticola Domin ex Steenis, Fl. Males. ser. 1, 4: 66 (1949).

Torrenticola Domin, Biblioth. Bot. 89[2]: 150 (1926) [Jan. 1926, not 1925], *nom. prov.*

Torrenticola Domin ex Steenis, J. Arnold Arbor. 28: 421 (1947), *nom. inval.*

Torrenticola queenslandica (Domin) Domin ex Steenis, Fl. Males. ser. 1, 4: 68 (1949).

Podostemum queenslandicum Domin, Biblioth. Bot. 89[2]: 149 (1926) [Jan. 1926, not 1925], as *Podostemon.*

Torrenticola queenslandica Domin, op. cit. 150, *nom. prov.*, and 89[6]: tab. 35, figs 7–13 (1928), *nom. inval.*

Torrenticola queenslandica (Domin) Domin ex Steenis, J. Arnold Arbor. 28: 421 (1947), *nom. inval.*

DISCUSSION

Domin (1926) published a new species '**P. ?queenslandicus** n. sp.' under *Podostemum* [as *Podostemon*] Michaux. In his discussion following the species description he suggested that the new species might actually belong to a separate genus and provisionally designated this as '**Torrenticola** n. gen.'. In further discussion he referred to his new species as '*T. queenslandica*'.

Under Articles 34.1 and 34.2 of the International Code of Botanical Nomenclature (Greuter *et al.* 1988) I accept that the specific name *Podostemum queenslandicum* was validly published at this time. Both Domin's wording and the layout of the printed text show that Domin was actually accepting the new species within *Podostemum* although he indicated some taxonomic doubt. The epithet *queenslandicum*, at specific rank, is therefore attributable to Domin and originates from *P. queenslandicum* Domin (1926).

In contrast, the generic name *Torrenticola* and the specific combination *T. queenslandica* were not validly published by Domin in his 1926 paper. *Torrenticola* is not valid according to Article 34.1(b), which states clearly that a name is not validly published when it is merely proposed in anticipation of future acceptance, i.e. when it is a so-called provisional name. The name *T. queenslandica* is not validly published for

*National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

the same reason and also because the generic name *Torrenticola* had not been validated. Article 43.1 indicates that the name of a species is not validly published unless the name of the genus to which it is assigned is, either simultaneously or previously, validly published.

Domin (1928) later published a plate with seven detailed figures of his new species. These figures were captioned '*Torrenticola queenslandica* Dom.'. Apparently Domin was accepting by 1928 that the new species warranted the erection of a new genus and was accepting his former provisional generic name *Torrenticola* as being applicable. Article 42.2 allows for an analytical illustration to replace the written description or diagnosis usually required for valid publication. However, this Article applies only to publications prior to 1 January 1908 and therefore cannot be invoked for validation of the names *Torrenticola* and/or *T. queenslandica* from Domin's 1928 plate. The caption apparently satisfies Articles 41.2(b) and 41.3(b) which allow for the names of genera and species to be validly published by a reference (direct or indirect) to a previously and effectively published description or diagnosis 'of a genus' (for genera) or 'of a species or infraspecific taxon' (for species). The indication of the author's name in the caption '*Torrenticola queenslandica* Dom.' renders the caption acceptable under Article 32.4 as an indirect reference to Domin's 1926 paper (where a specific description and a generic diagnosis appear). However, Articles 41.2(b) and 41.3(b) do not apply in the present instance as Article 42.1 indicates clearly that any reference, whether direct or indirect, to an earlier description or diagnosis is not acceptable in cases of simultaneous validation of a generic and a specific name. For this reason (and for a further provision of Article 42.1; see next paragraph) the names *Torrenticola* and *T. queenslandica* can not be considered simultaneously validly published in Domin's 1928 publication.

Most current publications, including Index Nominum Genericorum (Farr *et al.* 1979), attribute the valid publication of *Torrenticola* and *T. queenslandica* to Van Steenis (1947) in the Journal of the Arnold Arboretum. In that publication Van Steenis cited '*Torrenticola queenslandica* Domin in Bibl. Bot. 89^2: 149, pl. 35, fig. 7–13. 1925', thereby basing his acceptance of both the generic and specific names on Domin's papers of 1926 [not 1925] and 1928 and automatically accepting the same type as that used by Domin. Van Steenis gave no description or diagnosis, nor did he mention the generic name *Torrenticola* independently of its use within the specific name. Article 42.1 ('The names of a genus and a species may be simultaneously validated by provision of a single description or diagnosis . . .') may have been applied to Van Steenis's publication except that his paper lacks a description or diagnosis and his reference to Domin's prior description is unacceptable because Article 42.1 further states that, in cases of simultaneous validation, '. . . Reference to an earlier description or diagnosis is not accepted . . .'. The same Article also disallows simultaneous validation of generic and specific names when any prior name (at any rank) has already been validly published based on the same type. In the present case *Podostemum queenslandicum* Domin (1926) constitutes such a prior name. I can find no justification for accepting either *Torrenticola* or *T. queenslandica* as being validly published by Van Steenis in the Journal of the Arnold Arboretum cited.

Engler in Engler and Prantl, Nat. Pflanzenfam. edn 2, 18a: 484 (1930), referred to *Torrenticola* and *T. queenslandica* but, following Domin's works which he cited, retained these under *Podostemum* [as *Podostemon*]. The names therefore remain invalid in Engler's work.

Van Steenis (1949) included *Torrenticola* and *T. queenslandica* in his account of Podostemaceae in Flora Malesiana and this must surely be accepted as the place and date of valid publication of both names. Here *Torrenticola* is clearly accepted in both the key and the text as the name of a distinct genus and Domin's two papers are cited under *Torrenticola* thus: 'Domin, *nom. prov.* Bibl. Bot. 89, 2 (vol. 20) (1925) 149, t. 35, f. 7–13'. The citation of p. 149 can be treated merely as a bibliographic error of citation, p. 150 being the actual page on which Domin proposed the provisional name *Torrenticola* n. gen. and gave his Latin diagnosis of it. Van Steenis (1949) therefore satisfies the requirements of Article 36.1 for a reference to a previously and effectively

published Latin description or diagnosis. As he attributed the generic name to Domin the complete citation of it is *Torrenticola* Domin ex Steenis; this may be shortened to *Torrenticola* Steenis (Article 46.3).

Van Steenis (1949) cited '**Torrenticola queenslandica** Domin, l.c.' under the genus *Torrenticola*. As we have seen, Domin had only mentioned this combination provisionally but had validly published *Podostemum queenslandicum* Domin on p. 149 of his 1926 paper cited by Van Steenis. Van Steenis (1949) therefore validated a new combination *Torrenticola queenslandica* (Domin) Steenis (1949) based on *Podostemum queenslandicum* Domin (1926) (Article 49.1). As Domin also had provisionally suggested the name *T. queenslandica* the complete but optional citation for it (Article 46.3) is *T. queenslandica* (Domin) Domin ex Steenis (1949).

REFERENCES

Farr, E. R. *et al.* (eds) (1979). Index nominum genericorum (plantarum). Vol. 3, *Pegaeophyton–Zyzygium*. *Regnum Veg.* vol. 102.

Greuter, W. *et al.* (eds) (1988). International code of botanical nomenclature. *Regnum Veg.* vol. 118.

Revised manuscript received 2 August 1988

ACACIA CAERULESCENS, A NEW SPECIES OF *ACACIA* SECTION *PHYLLODINEAE* FROM VICTORIA

by

B. R. MASLIN[1] and A. B. COURT[2]

ABSTRACT

Maslin, B. R. & Court, A. B. *Acacia caerulescens*, a new species of *Acacia* section *Phyllodineae* from Victoria. *Muelleria* 7(1): 131–134 (1989). — *Acacia caerulescens*, a new species referable to *Acacia* section *Phyllodineae* DC. and allied to *A. obliquinervia* Tind., is described and illustrated. It is endemic in eastern Victoria (Buchan–Lakes Entrance district) where it is restricted to limestone soils.

TAXONOMY

Acacia caerulescens Maslin & Court, sp. nov.

Acacia obliquinerviae affinis a qua imprimis differt phyllodiis 4–8 cm longis, (1–)1·5–3 cm latis, 1:w = 2–3·5(–6), glaucissimis, costa saepe nec valde excentrica, glande 5–25 mm supra pulvinum posita versus costam per nervo tenui obliquo conjuncta, pedunculis *c.* 6 mm longis aliquantum gracilibus, capitalis in alabastro globosis.

Allied to *A. obliquinervia* but differing principally in the following ways. Phyllodes 4–8 cm long, (1–)1·5–3 cm wide, 1:w = 2–3·5(–6), very glaucous, midrib often not markedly excentric. Gland 5–25 mm above the pulvinus and connected to midrib by a fine, oblique nerve. Peduncles *c.* 6 mm long, rather slender. Heads globular when in bud.

TYPUS: Beside Wulgulmerang–Buchan road, *c.* 4·3 km from Buchan by road, Gippsland, Victoria, 10 Nov. 1985, *A.B. Court* CBG 8506135 (HOLOTYPUS: CBG; ISOTYPI: AD, B, BRI, G, K, L, NSW, NY, MEL, PERTH, US).

Tree to 10–15 m tall, often ± pyramidal. *Branches* terete but very slightly angled at extremities, finely and obscurely ribbed, at least the youngest shoots slightly to moderately pruinose. *Phyllodes* slightly oblique, obovate to oblanceolate or elliptic to narrowly elliptic, rather abruptly narrowed into an obtuse apex, 4–8 cm long, (1–)1·5–3 cm wide, 1:w = 2–3·5(–6), thinly coriaceous, straight or frequently slightly recurved near the somewhat narrowed base, glabrous, glaucous; midrib apparent, central or slightly to markedly excentric (i.e. situated closer to the upper margin), yellowish to light brown; lateral nerves not pronounced, loosely anastomosing; marginal nerves yellow to light brown; pulvinus 3–5 mm long, wrinkled and brown to dark brown when dry. *Gland* solitary, 5–25 mm above the pulvinus and connected to it by a fine oblique nerve which is concurrent with the midrib for a short distance, and often branched at its point of divergence with one branch extending to the gland and the other rejoining the midrib. *Racemes* axillary and terminal, often arranged in panicles which may reach 9 cm long; raceme axes with 2–8 flower-heads, slightly flexuose, glabrous, variably pruinose, base ebracteate. *Peduncles c.* 6 mm long, rather slender (*c.* 0·5 mm wide when dry), glabrous, variably pruinose, with 2, basal, triangular, glabrous bracts (?homologous to stipules) <0·5 mm long, an extremely reduced phyllode often present between the bracts. *Flower-heads* globular, (15–)20–30-flowered, lemon yellow, lightly scented. Bracteoles spathulate to sub-peltate; claws linear but slightly dilated towards their fimbriolate apices, *c.* 1 mm long (equalling calyx); laminae circular to triangular-ovate, apiculate, *c.* 0·5 mm long, glabrous, brown. *Flowers* 5-merous. *Calyx* gamosepalous, $\frac{2}{3}$ length of corolla, very shortly divided (for *c.* $\frac{1}{8}$ its length or less) into ± broadly triangular, slightly inflexed,

[1] Western Australian Herbarium, Department of Conservation and Land Management, P.O. Box 104, Como, W.A., Australia 6152.
[2] Australian National Botanic Gardens, P.O. Box 1777, Canberra City, A.C.T., Australia 2601.
Present address: 71 Miller St., O'Connor, A.C.T., Australia 2601.

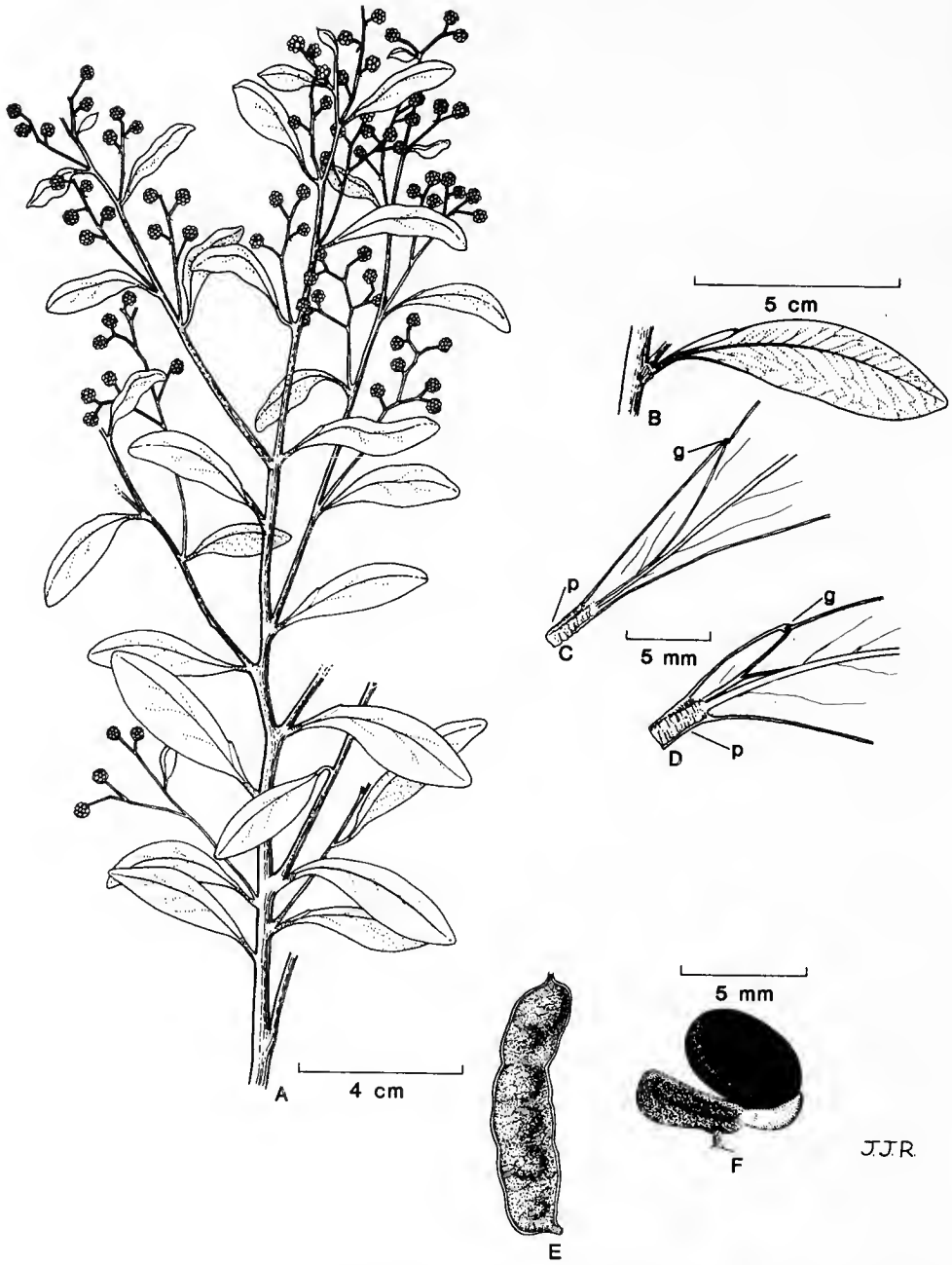

Fig. 1. *Acacia caerulescens* Maslin & Court. a — Portion of branch. b — Phyllode. c & d — Base of phyllode showing fine oblique nerve extending from gland (g) to pulvinus (p), note in D that this nerve bifurcates. e — Legume. f — Seed. a from *A.B. Court* CBG 8506135 (PERTH isotype); b & d from MEL 615165; c from MEL 615166; e–f from *J. Kenrick s.n.* (PERTH 00721689).

slightly keeled lobes. *Petals* 2·2–2·5 mm long, glabrous. Legumes oblong to narrowly oblong, 5–12 cm long, 1·4–2·2 cm wide, flat but rounded over seeds along midline of legume, slightly constricted between the seeds although occasional deep constrictions occur on some legumes, chartaceous, straight to very slightly curved, transversely loosely reticulate, glabrous, light- to medium-brown or purplish brown, pruinose (pruinosity patchy), stipitate, marginal nerve quite prominent but scarcely thickened. *Seeds* longitudinal or more usually longitudinally oblique in the legume, ellipsoid,

5–6 mm long, 3·5–4 mm wide, compressed (*c.* 2 mm thick), dull, black; pleurogram narrowed but open towards the hilum, not particularly prominent; areole 4 mm long, 2 mm wide; funicle at first straight, *c.* 2 mm long, normal to margin and closely appressed to inner wall of legume, then abruptly thickened, light red-brown and once-folded below the yellow, more or less clavate aril, aril constricted at its junction with the funicle.

OTHER SPECIMENS EXAMINED:

Victoria — Stony Creek crossing of the Princes Highway, Toorloo Arm, *D.E. Albrecht 2276* (CBG, PERTH); 2 mi [3·2 km] NNE. of Swan Reach on Bruthen Road, *A.C. Beauglehole 37683* (MEL); Toorloo Arm Reserve, Princes Highway, *A.C. Beauglehole 37851* (MEL); Cultivated, Buffalo Creek near Myrtleford, *F.E. Bienvenu 0623* (PERTH); Tambo Upper road, *L.A. Fell 3149* (MEL); Cultivated, Melbourne Botanic Gardens, 10 Jan. 1986, *J. Kenrick s.n.* (PERTH 00512044); Cultivated, near Baileau Library, Melbourne University, 7 Jan. 1984, *J. Kenrick s.n.* (PERTH 00721689); Buchan River, Mar. 1854, *F. Mueller s.n.* (MEL 615167); Buchan, about 1939, *F. Robins s.n.* (MEL 522743); Murrindal, *N.A. Wakefield 4103* (MEL); Buchan, 11 Nov. 1964, *J.H. Willis s.n.* (MEL 502498); On rocks at the Buchan River, *anonymous* (MEL 61514); Buchan River, *anonymous* (MEL 615165); Tambo River, *anonymous* (MEL 615166).

DISTRIBUTION:

Restricted to the Lakes Entrance–Buchan district in eastern Victoria where it is known only from the Swan Reach–Tambo Upper area and Lake Tyers north to the Murrindal area.

ECOLOGY:

Key associates of the Buchan populations include *Eucalyptus melliodora* Cunn. ex Schauer, *Acacia falciformis* DC. and *Themeda triandra* Forssk., forming a grassy woodland. By contrast, the Toorloo Arm population is associated with *Eucalyptus baueriana* Schauer and *E. globulus* ssp. *pseudoglobulus* (Naudin ex Maiden) Kirkpatr. open forest with a shrubby understorey dominated by *Pomaderris oraria sens. lat.*

The population at Toorloo Arm grows on clay over fossiliferous limestone. It appears that the distribution of this species is strictly associated with limestone geology.

CONSERVATION STATUS:

Populations of this species have been fragmented and depleted historically by land clearance for settlement and agriculture. Remnant populations are currently threatened by further land clearing, especially on private land, and particularly by roadworks.

Since 1985 there have been major road widening operations with local realignments north from Buchan along the Wulgulmerang–Buchan road, to about half-way between Buchan and Murrindal. These have significantly reduced the populations in the roadside reserves, which are already remnants adjacent to agricultural land. The roadworks have extended as far north as all the known roadside populations of the species.

In the vicinity of the Princes Highway crossing over Toorloo Arm, within the Lake Tyers Forest Park, there is preserved a significant population containing a number of mature, 10–15 m tall specimens. However, several outstanding individuals on the east side of the Arm, overlooking the Princes Highway, have been lost recently through major road reconstruction works at the crossing.

FLOWERING AND FRUITING PERIOD:

Flowering commences in early November but its termination is not known; immature legumes (resulting from the previous flowering season) are often present with flowers in November. Legumes with mature seeds have been collected in early January.

AFFINITIES:

On account of its globular flower-heads and 1-nerved phyllodes *A. caerulescens* is placed in *Acacia* section *Phyllodineae* DC. The species was included by Court (1973, page 224) and Costermans (1981, page 318) as a variant of *A. obliquinervia.* The two species have glabrous, pruinose branchlets and similar phyllode, inflorescence and

carpological features. *Acacia obliquinervia* is most readily distinguished from *A. caerulescens* by its grey-green to glaucescent phyllodes which are often longer (5–17 cm long) and which possess a gland (0–12 mm above pulvinus) that does not have an associated fine oblique nerve extending to the pulvinus. Also, *A. obliquinervia* has thicker, shorter peduncles (1·5–5 mm long) and often oblongoid flower-head buds. *obliquinervia* is widespread in Victoria and New South Wales where it occurs in ranges between 500 m and 1700 m, especially in montane forests (Costermans 1981). The new species occurs at lower elevations on limestone soils and has a very restricted geographic range; it is not known to be sympatric with *A. obliquinervia.*

CULTIVATION:

According to Elliot and Jones (1982, p. 132) this very ornamental species will grow in a wide range of soils, is best suited to partial or full sun and withstands frosts and extended dry periods. It is ideal for gardens and roadsides, windbreaks and shelter planting. It is very attractive on account of its blue foliage and bright, lemon yellow heads.

ETYMOLOGY:

The specific epithet refers to the characteristic blue foliage.

COMMON NAME:

Buchan Blue or Buchan Blue Wattle.

ACKNOWLEDGEMENTS

Mr D. G. Cameron (Botany Department, Latrobe University, Victoria) is gratefully acknowledged for providing the ecological and conservation status data presented here. Bill Molyneux (Montrose, Victoria) is thanked for providing observation on flowering and fruiting phenology. Paul Wilson (W.A. Herbarium) is thanked for providing the Latin diagnosis.

REFERENCES

Costermans, L. (1981). 'Native trees and shrubs of south-eastern Australia'. (Rigby: Melbourne.)

Court, A. B. (1973). *In* Willis, J. H. 'A handbook to plants in Victoria'. (Melbourne University Press: Carlton.)

Elliot, W. R. & Jones, D. L. (1982). 'Encyclopaedia of Australian Plants suitable for cultivation', vol. 2. (Lothian Publishing Company: Melbourne.)

Manuscript received 16 August 1988

NOTES ON HOVEA R. Br. (FABACEAE): 3

by

J. H. Ross*

ABSTRACT

Ross, J. H. Notes on *Hovea* R. Br. (Fabaceae): 3. *Muellèria* 7(1): 135–139 (1989). *H. arnhemica* from the Northern Territory is described as new. *H. longifolia* R. Br. var. *purpurea* (Sweet) Domin subvar. *planifolia* Domin from south-eastern Queensland is elevated to species rank as *H. planifolia* and the necessary combination is made.

HOVEA ARNHEMICA

Hovea arnhemica J.H. Ross sp. nov.

Affinite incerta, forsan *H. planifoliae* (Domin) J.H. Ross affinis, a qua corolla semper albida, planta multo minore, caulibus brevibus erectis vel decumbentibus, foliis minoribus lamina plus minusve plana, inflorescentia sessili, floribus minoribus, et arillo seminis quam semine ultra dimidio breviore, differt.

TYPUS: Northern Territory, Arnhem Land, 3 km NW. of Murgenella, 2.iv.1984, *C.R. Dunlop 6673* (HOLOTYPUS: MEL; ISOTYPI: AD, BRI, CANB, CBG, DNA, HO, K, NSW, PERTH).

Subshrub to 60 cm high with a large lignotuber, multi-stemmed, the stems erect or decumbent, densely clothed with short curled hairs and longer straighter hairs up to 1·4 mm long, the hairs faintly or distinctly rusty-brown. *Leaves* spreading almost at right angles to the stem or deflexed, lamina more or less flat on upper surface on either side of the depressed midrib, lamina of upper leaves narrow-ovate or elliptic and of smaller lower or basal leaves ovate, obovate or subrotund, (0·7)2–6·3 cm long, (0·5)0·8–1·5 cm wide, apex acute, obtuse or sometimes emarginate, upper surface densely clothed with short curled white hairs, lower surface densely clothed with curled and scattered straightish white hairs except on midrib and margin where hairs are tinged with brown; petiole up to 0·3 cm long, densely clothed like the stem. *Stipules* subulate, up to 3 mm long, spreading laterally or somewhat recurved and often persisting for some time, glabrous and glossy above, densely pubescent on lower surface. *Inflorescence* axillary, sessile, mostly 2- or 3-flowered, rarely flowers solitary. *Flowers* pedicellate, the pedicels up to 1·5 mm long, densely clothed with spreading hairs; bracteoles narrow-ovate, 2–3·5 mm long, 0·8–1·3 mm wide, situated at the base of the calyx and shorter than or almost as long as the calyx-tube, inner surface with scattered appressed hairs, outer surface densely clothed with spreading hairs, with a conspicuous tuft of dark reddish-brown hairs in the axils; bract inserted at the base of the pedicel, narrow-ovate, 1·8–2·4 mm long, 1–1·2 mm wide, outer surface densely clothed with spreading hairs. *Calyx* densely clothed with short curled and longer straighter rusty-brown to whitish hairs: 2 upper lobes 5·5–6 mm long including the tube 1·5–2·5 mm long, the 3 lower lobes 2–2·7 mm long, acute. *Standard* 6–6·6 mm long, 7–8 mm wide, emarginate apically, white except for a greenish-yellow basal flare; wings 5·7–6 mm long, 2·2–2·8 mm wide; keel 4·8–5·2 mm long, 2–2·5 mm wide. *Stamen-filaments* 3·5–4·5 mm long. *Ovary* sessile or very shortly stipitate, 1·2–1·5 mm long, 2-ovulate. *Pods* sessile or almost so, obliquely ovoid or ellipsoid or sometimes transversely elliptic, 1·1–1·4 cm long, 1·1–1·4 cm wide, densely clothed with white matted hairs externally, fairly densely clothed with weak white hairs within. *Seeds* elliptic, plump, 4·7–5·8 mm long, 3·3–4·2 mm wide, 2·8–3·5 mm thick, chestnut-brown, hilum linear, the aril less than half the length of the seed, with a raised lateral lip. (Fig. 1).

*National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

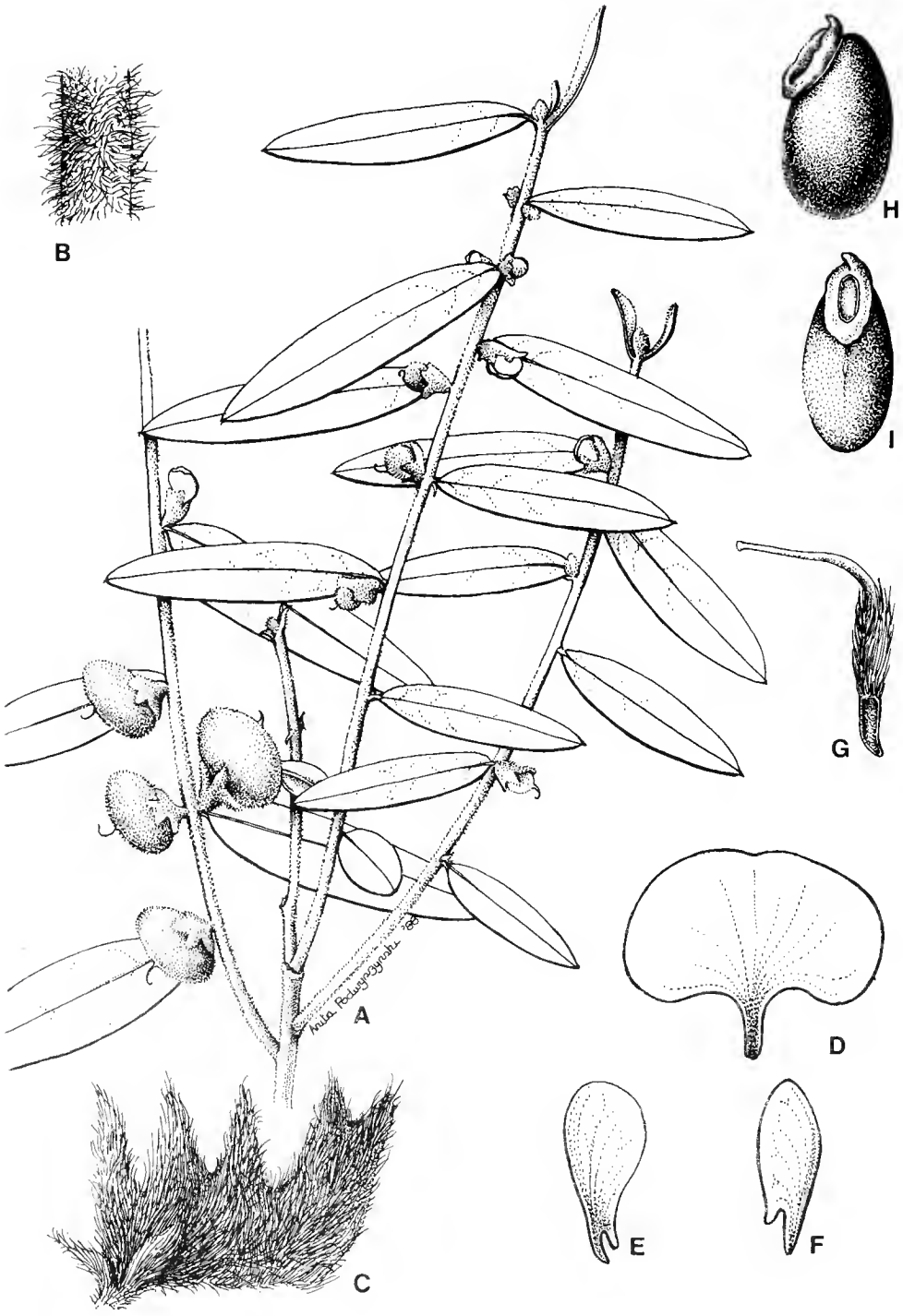

Fig. 1. *Hovea arnhemica*. A — flowering and fruiting twig, ×1. B — surface of portion of stem showing indumentum, ×5. C — calyx opened out (upper lobes on right), ×4. D — standard, ×4. E — wing petal, ×4. F — keel petal, ×4. G — gynoecium, ×9. H — seed, side view, ×4. I — seed, hilar view, ×4. A–H from C. R. Dunlop 6673 (MEL 113278 and 113279).

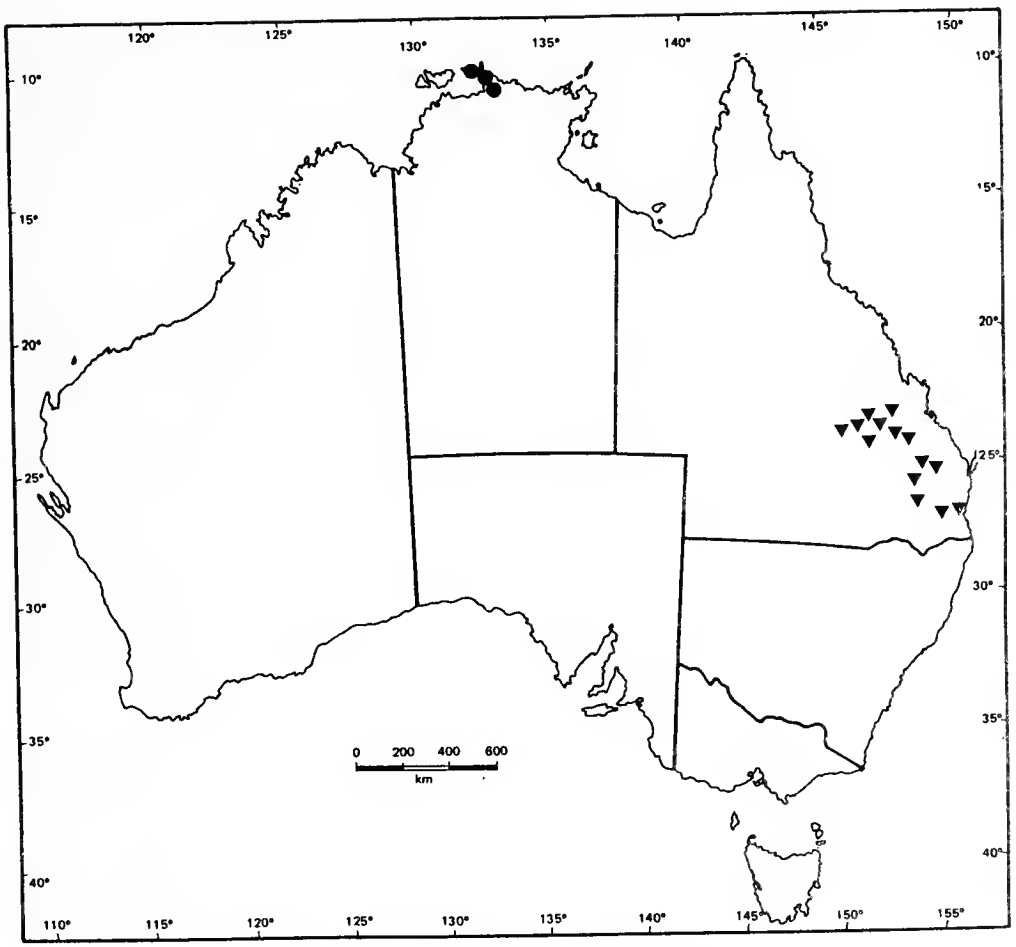

Fig. 2. The known distribution of *H. arnhemica* (●) and *H. planifolia* (▼).

Restricted in distribution to Arnhem Land north and north-west of Oenpelli in the Northern Territory (see Fig. 2). Recorded on deep sandy soil in open *Eucalyptus, Gronophyllum–Eucalyptus–Livistona* and *Ptychosperma elegans* forest. Often locally common.

REPRESENTATIVE SPECIMENS (Total number examined 15):

Northern Territory — 48 km N. of Oenpelli, 15.vii.1961, *G.M. Chippendale* sub NT 8101 (NT, MEL). 4 km SSW. of Raffles Bay, 19.vii.1961, *G.M. Chippendale* sub NT 8216 (NT, MEL). Port Essington, 21.iv.1818, *A. Cunningham* (CGE). Smith Point, Cobourg Peninsula, 8.x.1971, *J. Must 827* (DNA, NSW, NT). 1 km W. of Nabarlek, 12° 18′ S., 133° 18′ E., 22.iv.1979, *M.O. Rankin 2101* (BRI, DNA). Murgenella road, Cobourg Peninsula, 11° 20′ S., 132° 22′ E., 31.v.1983, *G. Wightman 444 & C.R. Dunlop* (DNA, MEL).

NOTES:

This species was first collected by Cunningham on 21 April 1818 at Port Essington on the Cobourg Peninsula when he accompanied Lieutenant King in the 'Mermaid' (a duplicate in E numbered 270 from BM bears the date 1817 but presumably this is in error). Cunningham's material was referred to by Bentham (1864) as being closest to *H. longifolia* var. *pannosa* and was included by Domin (1925) under *H. longifolia* var. *lanceolata* subvar. *apiculata*. Apparently the species was not re-collected until the early 1960s.

H. arnhemica is isolated geographically from all of the other species in the genus and differs from all of them in that the corollas are apparently always white except for a

basal greenish-yellow flare on the standard. The affinities of *H. arnhemica* are not clear. The species is perhaps allied to *H. planifolia* from south-eastern Queensland from which it differs in being a much smaller plant with short erect or decumbent stems, in having smaller leaves spreading almost at right angles to the stem or deflexed, the leaf lamina more or less flat, sessile inflorescences, smaller flowers and seeds with an aril less than half the length of the seed.

HOVEA PLANIFOLIA

Domin (1925) followed Bentham (1864) in treating *H. longifolia* R. Br. as an 'omnibus' species and recognised within it five varieties and five subvarieties, one of which was var. *purpurea* (Sweet) Domin subvar. *planifolia* Domin. The brief description of subvar. *planifolia* was based on specimens ('viele Exemplare') collected by A. Dietrich from the Brisbane River, south-eastern Queensland, and on a specimen collected by F. Mueller from the same locality in August 1855.

The following syntypes have been located: Brisbane River, *A. Dietrich* (BRI 345294, HBG (5 sheets), NSW 166516, PR 527088, 527089, PRC, W 108297, 108299); Brisbane River, *F. Mueller*, August 1855 (K). MEL 667189 collected by Mueller from the Brisbane River is almost indistinguishable from the specimen in K but as it was collected in July 1855 rather than in August it is not regarded as a syntype.

It is clear that subvar. *planifolia* represents a taxon distinct from *H. longifolia* and that it merits specific rank. The opportunity is taken here of raising subvar. *planifolia* to specific rank and of providing a description and notes.

Hovea planifolia (Domin) J.H. Ross comb. & stat. nov.
BASIONYM: *H. longifolia* var. *purpurea* (Sweet) Domin subvar. *planifolia* Domin, Biblioth. Bot. 22 (89^2): 729, fig. 141 (right hand specimen) (1925). LECTOTYPE (here selected): Queensland, Brisbane River, August 1855, *F. Mueller* (K).

Shrub 0·5–2(–2·5) m high, often wider than high, usually with several stems or the single stem branching at or a short distance above the base, branches ascending and spreading, branchlets densely clothed with short coiled or crinkled hairs and longer curled, crinkled or straightish hairs up to 9 mm long, the hairs on the young tips distinctly bright rusty-brown or reddish-brown. *Leaves* usually held more or less erect and almost perpendicular to the lateral branches or almost parallel to the vertical branches, sometimes held at an angle of about 45° but the lower surface usually conspicuous: lamina arched up slightly on either side of the depressed midrib and recurved towards the margin or slightly to distinctly V-shaped in section or sometimes more or less flat, narrow-ovate or elliptic, (2–)4–10(–13) cm long, (0·5–)0·9–2(–2·7) cm wide, apex rounded, obtuse or subacute, with a short mucro, upper surface dark green, sparingly to densely clothed throughout with short curled or twisted hairs or the hairs largely confined to the midrib and decreasing in frequency towards the margins, lateral veins sometimes prominent and somewhat raised, lower surface densely clothed with short coiled or curled hairs and longer curled, twisted or straightish hairs, the hairs greyish-white or rusty-brown, lateral veins often prominent despite the dense indumentum; petiole 0·3–0·9 cm long, densely pubescent like the branchlet. *Stipules* subulate, 2–3·2 mm long, 0·3–0·6 mm wide, densely clothed externally (abaxial surface) with short curled or crinkled hairs and longer spreading hairs, the hairs usually conspicuously rusty or reddish brown. *Inflorescence* axillary, on densely pubescent peduncles 0·2–0·8 cm long and usually 3-flowered or occasionally the axis growing on to form a many-flowered leafy shoot. *Flowers* pedicellate, the pedicels up to 2·5 mm long, densely clothed with short coiled or curled hairs and longer wavy or straightish spreading hairs; bracteoles narrow-ovate, 2·4–3·1 mm long, as long as to slightly longer than the calyx-tube, inserted at the base of the calyx, densely clothed with coiled, curled and longer wavy or straightish spreading hairs, the hairs usually bright rusty-brown; bract 2·5–3·5 mm long, inserted almost at the same level as the bracteoles; bract 2·5–3·5 mm long, inserted almost at the same level as the bracteoles; bract and bracteoles with reddish-brown glandular hairs in the axils. *Calyx*

densely clothed with coiled, curled or longer straighter hairs, the hairs silvery-white throughout or tinged with rusty-brown especially apically: 2 upper lobes ± truncate, 4–5·2 mm long including the tube 2–3·5 mm long, the 3 lower lobes 1·5–2 mm long. *Standard* 8·6–9·5 mm long, 9·5–11 mm wide, pinkish-purple when young but turning purplish with age, with a greenish-yellow basal flare; wings 5·7–7·5 mm long, 3·3–4·2 mm wide; keel petals 4·5–5·9 mm long, 2·3–3 mm wide. *Stamen-filaments* 4·2–5·5 mm long. *Ovary* shortly stipitate, 1·5–2·5 mm long, densely pubescent, 2-ovulate. *Pods* shortly stipitate but stipe not exceeding the calyx-tube, obliquely or transversely ovoid or ellipsoid, 1–1·4 cm long, 0·8–1·6 cm wide, densely clothed with curled, twisted and wavy hairs externally, sparingly to densely clothed with weak curled or wavy hairs internally. *Seeds* ellipsoid, plump, 5·5–6·6 mm long, 3·8–4·2 mm wide, 3·5–3·6 mm thick, chestnut brown, hilum linear, the aril with a very small raised lateral lip and extending for almost the length of the seed.

Restricted in distribution to the Burnett, Darling Downs, Leichhardt, Maranoa and Moreton districts of south-east Queensland. Recorded most frequently from laterite, sandstone or shallow sandy soil among sandstone outcrops in open dry sclerophyll forest.

Representative Specimens (Total number examined 73):

Queensland — Burnett Distr., 44 km from Mundubbera on Durong Rd, 3.x.1982, *P.I. Forster 1408* (BRI); Darling Downs Distr., Barakula State Forest, 15·2 km E. of Chinchilla–Auburn Rd on road to Ballon Forest Office, 19.viii.1986, *J.H. Ross 3095* (BRI, MEL); Leichhardt Distr., Blackdown Tableland, 32 km SE. of Blackwater, 20.iv.1971, *R.J. Henderson, S.B. Andrews & P. Sharpe 724* (BRI, MEL, NSW); Maranoa Distr., 12 km NNE. of Mt Moffatt H.S., 13.v.1982, *V.J. Nelder & M.B. Thomas 711* (BRI); Moreton Distr., Blackstone, *c.* 8 km SE. of Ipswich, 3.x.1959, *L. Pedley 486* (BRI).

H. planifolia is distinguished readily by the large leaves which are amongst the largest found in the genus and by the distinctive bright rusty or reddish-brown hairs on the apices of the young growing shoots. The name *H. pannosa* Cunn. ex Hook. has been misapplied to this plant in Queensland.

An attractive open shrub with a generally greenish-grey appearance which would appear to have considerable horticultural potential.

ACKNOWLEDGEMENTS

I am most grateful to Dr G. P. Guymer for answering enquiries and for photographing type specimens while serving as Australian Botanical Liaison Officer at the Herbarium, Royal Botanic Gardens, Kew; to Mr C. R. Dunlop, Darwin Herbarium, for making a special trip to collect specimens which serve as the type material of *H. arnhemica*; to Mr C. R. Dunlop, Dr G. Leach, Mr G. Wightman and staff of the Darwin Herbarium for organising a most enjoyable field trip to Arnhem Land; to Mr L. Pedley, Queensland Herbarium, for accompanying me in the field in south-eastern Queensland; to Mrs Betty Ballingal, Oakey, Queensland, and Mrs Val Hando, Chinchilla, Queensland, for making special collections; to Mr A. S. George, Bureau of Flora and Fauna, Canberra, for correcting the Latin diagnosis; to my colleague Miss A. M. Podwyszynski for preparing the illustration which accompanies the text; to Ms J. Hurse for technical assistance; to the Directors/Curators of BRI, CGE, DNA, E, HBG, HO, K, NSW, PR, PRC and W for the loan of specimens and/or working facilities in their institutions; to Mrs J. Thomas for typing the manuscript; and for an Australian Biological Resources Study grant which greatly facilitated this project.

REFERENCES

Bentham, G. (1864). 'Flora Australiensis', vol. 2. (Lovell Reeve: London.)
Domin, K. (1925). Beitrage zur Flora und Pflanzengeographie Australiens. *Biblioth. Bot.* 22 (89²): 729.

Revised manuscript received 11 October 1988

CONTENTS

Volume 7, Number 1 Page

Two new lichens: *Cladonia paeminosa* and *C. humilis* var. *bourgeanica*
— Alan W. Archer 1

Eucalyptus cadens (Myrtaceae), a new swamp gum from the Warby Range, North-East Victoria
— J. D. Briggs and M. D. Crisp 7

Azorella Lamarck (Apiaceae) on Heard and Macquarie Islands, with description of a new species
— A. E. Orchard 15

Notes on *Hovea* R. Br. (Fabaceae): 2
— J. H. Ross 21

A revision of *Podotheca* Cass. (Asteraceae: Gnaphaliinae)
— P. S. Short 39

Notes on the fruit anatomy of Australian members of the Inuleae (Asteraceae)
— P. S. Short, K. E. Wilson and J. Nailon 57

Two new species of *Pomaderris* Labill. (Rhamnaceae) from South-Eastern Australia
— Neville G. Walsh 81

A new subspecies of *Grevillea acanthifolia* (Proteaceae: Grevilleoideae) from South-Eastern New South Wales
— R. O. Markinson and D. E. Albrecht 89

A new species of *Tetrarrhena* R.Br. (Poaceae) from Victoria and New South Wales
— Neville G. Walsh 95

Ferdinand Mueller, Government Botanist: the role of William Hooker in his appointment
— Helen M. Cohn 99

New genera and species of Australian Inuleae (Asteraceae)
— P. S. Short 103

Olearia archeri (Asteraceae: Astereae), a new name for a familiar species from Tasmania
— N. S. Lander 117

Olearia astroloba (Asteraceae: Astereae), a new species endemic to Victoria
— N. S. Lander and N. G. Walsh 123

Valid publication of the names *Torrenticola* and *T. queenslandica* (Podostemaceae)
— Helen I. Aston 127

Acacia caerulescens, a new species of *Acacia* section *Phyllodineae* from Victoria
— B. R. Maslin and A. B. Court 131

Notes on *Hovea* R. Br. (Fabaceae): 3
— J. H. Ross 135

ISSN 0077-1813

Jean Gordon, Government Printer, Melbourne